VETERINARY MEDICINE

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Florida State Veterinary Medical Association Meeting

Treatment of Conditions Affecting Bovine Fertility

Sludged Blood

Diseases of Poultry and Pet Birds

Immunization with Modified Living Virus with Particular Reference to Rabies and Hog Cholera

A Unique Type of Radiation Therapy

Clinical Use of Therapeutic Agents Containing Chlorophyll

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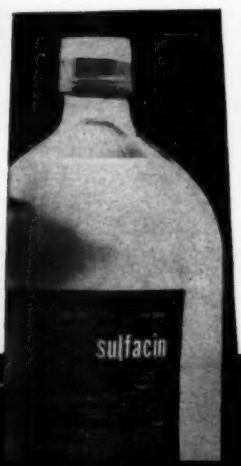

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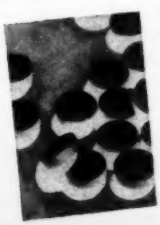

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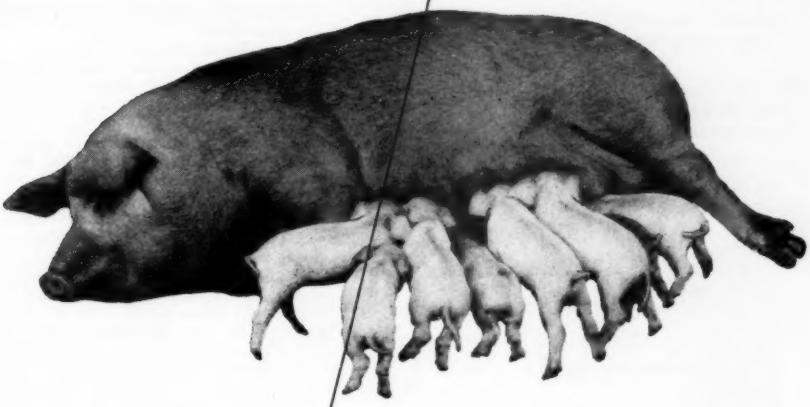

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Florida State Veterinary Medical Association Meeting

CONTAGIOUS enthusiasm characterized the 22nd annual meeting of the Florida State Veterinary Medical Association held at the Hotel Floridan, Tampa, on October 28-30, 1951.

Theme of the meeting was "Make veterinary service in Florida the finest obtainable in the world." The large number in attendance, drawn by the promise of an excellently prepared program, were not disappointed. All sessions assembled promptly and were well attended. Active discussions succeeded each presentation in which many took part.

Dr. D. A. Sanders, retiring president

Dr. C. E. Dee, president

Dr. Robert P. Knowles, secretary-treasurer

A number of scientific papers were illustrated by motion pictures. These do not lend themselves to words. They provided interesting and enlightening material for those viewing them.

In so far as possible, addresses of speakers are reproduced on the following pages. Regrettably there are omissions necessary because of the character of the presentations (demonstrations, pictures, etc.), material previously submitted for publication, or for other reasons known only to those contributors whose papers are not included.

Social features of the meeting included the Hospitality Hour following the Sunday afternoon session which was devoted to clinical briefs and demonstrations. A banquet and dance were held on Monday evening, at which time the Association honored Dr. John R. Wells, president of the A.V.M.A., who delivered the principal address, and Mrs. C. E. (Helen) Bild, president of the Women's Auxiliary to the A.V.M.A. Florida is proud to have members head both national organizations. By resolution, Dr. C. Paul Vickers was honored for his contributions to veterinary medicine in Florida.

Officers

New officers selected to serve the Association for the coming year were Dr. C. E. Dee, Hollywood, president; Dr. Ronald F. Jackson, St. Augustine, vice-president; and Dr. R. P. Knowles, Miami, secretary-treasurer, to succeed Dr. V. L. Bruns, Williston.

Women's Auxiliary

Mrs. R. L. Brinkman, Live Oak, presided at the 4th annual meeting of the Women's Auxiliary to the F.S.V.M.A. Honor guest was Mrs. C. E. (Helen) Bild, Miami, president of the National Auxiliary.

New officers elected for the year were: Mrs. Robert P. Knowles, Miami, president; Mrs. Ronald F. Jackson, St. Augustine, vice-president; Mrs. C. Paul Vickers, Tallahassee, secretary; Mrs. Charles F. Simpson, Gainesville, treasurer; and Mrs. Glenn Van Ness, Gainesville, parliamentarian.

Treatment Of Conditions Affecting Bovine Fertility*

E. E. CHAMBERS, D.V.M., Rossville, Georgia

IN any consideration of problems of infertility in cattle, one must not overlook the fact that the sire may be infertile. In this discussion, it is assumed that the bull is fertile. Abnormalities of the female only will be considered.

Placentitis, or retention of the fetal membranes, is frequently overlooked as a breeding problem. Inflammatory processes may affect future breeding efficiency. When called to remove retained placenta, the veterinarian should bear in mind that his purpose is to restore a pathological organ to a normal state. This is done either by removal or by medication. Fetal placenta should be removed within 24 to 36 hours if this can be accomplished with ease to the cow and operator. If this work cannot be done without pain and discomfort to the patient, the uterus should be treated and the membranes removed at a later date. Improper treatment may predispose to anomalies to be discussed later.

Abortions

Nothing sets the cattle owner on edge as much as, and nothing can put him out of business any quicker than, abortion. Enzootic abortions in a herd can be a real puzzle. In the writer's practice, brucellosis is the most common cause of premature births, especially when they occur in the latter half of gestation. First an attempt should be made to correct mineral deficiency in the diet because it is one thing that can be done while blood samples are being tested. Number two, blood-test the entire herd for brucellosis and at the same time draw two extra blood samples from each cow that has aborted; one of these to be tested for vibriosis, the other for leptospirosis. These three are the big factors to be considered. If all of these prove negative, nutritional deficiencies should be investigated again. Each animal in the herd should be examined for pregnancy. Armed with data and after elimination of sporadic causes such as fevers, etc., one can proceed with treatment indicated or refer history and further samples for laboratory research.

Brucellosis. This can be controlled by segregation and vaccination. If the owner will cooperate, good results usually follow such rational treatment.

Vibriosis. During an outbreak of vibriosis little can be done to stop the spread except to segregate aborting cows. The disease frequently is self-limiting. Usually only a few, percentagewise, abort. After an outbreak, one can expect sporadic abortions due to vibriosis. It is generally believed that cows develop an immunity to the infective agent, and that one abortion confers immunity. The exact method of spread of vibriosis is not known nor is that part played by the bull generally understood. From personal communication with Dr. H. Lincoln Easterbrooks, extension veterinarian, Storrs Agricultural Experiment Station, Storrs, Conn., the following is quoted: "Circumstantial evidence does indicate that vibriosis may be spread by bulls. This unfortunately does not constitute proof although we are inclined to believe it to be the cause. We do recommend that bulls be tested and when possible positive and suspect bulls be withdrawn from service until such time as blood titers return to negative. We know from unpublished experimental results that it is possible to infect heifers artificially by adding *Vibrio fetus* to semen with which they are inseminated. This certainly shows that a bull could spread the disease.

"Resistance tends to increase in animals which have been infected and only occasionally, in our experience, have infected cows aborted more than once. One real problem, however, is the insistence of some people that vibriosis is the entire problem when brucellosis also occurs in the herd. As a rule, a dairyman is far more willing to admit the presence of vibriosis that he is to admit the presence of brucellosis; thus confounding the problem considerably.

"One of the important aids which can help in controlling this disease is the use of artificial

*Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

insemination with antibiotic-treated semen. All breeding associations with which we are familiar are carrying on some practice of this type. If herd bulls are to be used, their semen, too, can be diluted and treated with 500 micrograms of dihydrostreptomycin sulfate per ml. before inseminations are made.

"Limited observations indicate that intramuscular injections of streptomycin may hasten the return of reacting bulls to negative."

On the subject of treatment of cows that have aborted from vibriosis, a letter dated June 1950 from Dr. W. N. Plastridge, Storrs, Conn., is quoted: "In the treatment of animals that fail to conceive after two services, limited observations indicate that intrauterine infusions (at time of heat) of 0.5 to 1 gm. of streptomycin in 20 to 30 cc. of saline or penicle,®[1] and breeding on the heat following treatment may be helpful."

Leptospirosis. This disease has been diagnosed in my practice as a cause of abortion and from observation of three separate outbreaks it may be more prevalent than realized. Cows that abort from leptospirosis will usually show a titer to the complement fixation or agglutinin lysis test. Most of these abortions occur late in gestation and many of them within a day or so of term. These calves are all born dead and even some of the biggest and strongest looking cows require assistance in delivering the dead calf. Cows are weakened and do not have the strength to expel the fetus. One constant point in extremely late abortions due to leptospirosis is the large and edematous navel and cord. A near constant feature noted is the characteristic separation of the cord close to the belly.

In reference to contagiousness of leptospirosis, quoted is part of a letter from Dr. Charles J. York, research associate, Veterinary Virus Research Institute, Ithaca, N. Y.: "The period of incubation, after an animal is infected, is about seven to ten days. During the stage of fever, which may or may not be noticed, the Leptospira are in the blood stream and it is quite feasible that, with the infected blood, the disease can be transmitted by means of unclean needles or instruments and possibly through insect vectors. The role of insect vectors in this respect is not known, however. During the last part of the febrile stage, the organism becomes localized in the kidneys and may remain there for 60 to 90 days. During this time, organisms are eliminated in the urine. Intranasal inhalation of this urine spray infects other animals."

Because as few as three cases of leptospirosis a year can keep the disease active in a herd, its control is at best uncertain. Vaccination has been tried, but only experimentally, and probably the only way to stop abortions from this disease is to vaccinate unexposed animals and wait until the disease runs its course through the entire herd. Research men advise that this organism has high antigenic properties and, therefore, one might expect good results from vaccination.

Anestrum

Heifers that are not coming in heat should be examined for pregnancy. If those of breeding age have not conceived, ovarian dysfunction, such as nonfunctional or infantile ovaries, retained corpus luteum, or ovarian neoplasms, should be considered. In an adult or old cow, infertility may be due to nonfunctional ovaries, cystic degeneration of the corpus luteum, retained corpus luteum, mummified or macerated fetus, chronic metritis, neoplasms, etc.

On palpation of nonfunctional or infantile ovaries, they are noted to be small and smooth; many times no larger than a bean, in virgin heifers. In adult cows, ovaries may be of normal size but smooth and associated with an atonic uterus. Treatment recommended includes weekly massage and the administration of 5 mg. of di-ovocylin®[2] intramuscularly. In heifers, it is usually wise to check the nutritive intake and stilbestrol or other estrogenic hormones may be substituted for di-ovocylin. Treated cows usually come in heat in from one to three weeks.

Retained or persistent corpus luteum is quite common. Its prevalence is no doubt increased by lack of accurate records or observations as to previous periods of estrum. If a corpus luteum is on the right ovary at one examination and upon the left at subsequent examination, facts regarding the cycle may be established. Treatment of persistent or retained corpus luteum is to expel it either by manual manipulation or with hormones. The yellow body can be picked up with the thumb and forefinger and by firm but gentle pressure it usually can be dislodged. If the body is imbedded firmly, it can be rolled on the volar surface of the first finger and expressed by placing the knuckle of the thumb between the yellow body and the ovary. By exerting pressure similar to that of shooting a marble, the

®[1]Wallace Laboratories, Inc., New York, N. Y.

®[2]Ciba Pharmaceutical Products, Inc., Summit, N. J.

corpus luteum may be expelled. In some instances, hemorrhage may follow this treatment and result in hematoma or even death.

When the corpus luteum cannot be expressed by the above method, it can be removed by carrying a small, curved, sharp-pointed bistoury into the vagina with one hand. The other hand locates the ovary and with the corpus luteum ventral, the knife is thrust through the roof of the vagina and into the body. The knife is held steady and the ovary is moved so as to lay the corpus luteum open. With the capsule incised, it is an easy matter to express. After removal, ovaries should be massaged and the animal should come in heat in from four to seven days. Partial removal is a much safer operation and if the animal is worth examining, she is also worth treating. Many estrogens are available, but the writer uses only two: stilbestrol and di-ovocylin. Results with stilbestrol vary and cannot be depended upon. Di-ovocylin is the drug of choice.

It is the writer's usual practice to express partially the corpus luteum and give 5 mg. of di-ovocylin. If the animal does not come in heat, the ovaries are massaged and the injection repeated weekly. This treatment has not failed and the writer has yet to find an animal in such a condition that this schedule will not be effective. In a few instances, however, cystic ovaries have resulted following hormone injections.

Neoplasms occurring in and around the ovaries, horns, and uterus are not uncommon. These cases are usually hopeless unless the history indicates that at some earlier date the cow was treated for persistent corpus luteum or cystic ovaries by expressing or rupturing the body. This manual expression resulted in profuse hemorrhage with a hematoma as the result. In cases of hematoma, time will usually be the healer, and in many cases the clots can be slowly massaged from in and around the genital organs.

Cystic degeneration of the corpus luteum occurs quite frequently. It is diagnosed as a smooth blister-like cyst or cysts on one of the ovaries. This type of cyst is usually of medium size and has a slightly thicker wall than a cyst of nyphomania. Occasionally the cyst's wall is either so thick or it is imbedded so deep in the ovarian tissue that it is hard or impossible to rupture. When this happens, it can be opened with a knife as described under treatment of retained corpus luteum. Treatment for cystic degeneration of the corpus luteum will be explained under cystic ovaries that produce nyphomania, as identical treatment is recommended for both.

Mummification of the fetus is found more frequently in some herds than in others. It is also more prevalent in certain cow families, and often occurs more than once in a single individual. Upon rectal examination, a firm rubber-like mass, indicative of a mummified fetus, can be detected in the uterus. In such cases, this organ is usually located in the pelvic cavity. When routine pregnancy examinations are made, it is not uncommon to observe a cow that had a normal pregnancy earlier and now indicates that the developments of the uterus and contents have progressed backward instead of forward. If fluid is still present or if the uterus is still quite large and in the abdominal cavity, it is best to wait a few weeks before expelling the contents.

Treatment of mummified fetus is evacuation of the uterus. This is easily accomplished by expressing the corpus luteum and at the same time giving 25 to 50 mg. of stilbestrol or 5 mg. of di-ovocylin. The fetus is expelled in three to five days. If this fails, injections should be repeated with uterine massage at weekly intervals until desired results are obtained. In those instances where the owner reports that the fetus is not expelled but the cow came in estrum a few days following treatment, the vagina should be examined. Fetus is sometimes present in the body of this organ.

Irregular Heat Periods

Cows showing irregular heat periods usually have some type of ovarian dysfunction or uterine infection. However, the majority of so-called irregular heat periods are due to the herdsman forgetting to keep records. Cows that come in heat every few days or cows that seem to be in heat all the time usually develop a high tail head, enlarged flabby vulva, large neck and shoulder muscles, and a bull-like voice. These animals generally have one or more thin walled cysts from the size of a small nut to several inches in diameter on one or both ovaries. As a rule, these are easily ruptured.

Treatment of cystic ovaries consists of biweekly massages, making certain that all cysts are constantly being ruptured; or by the injections of hormones. In cases where biweekly massage fails, it is doubtful that cysts were actually ruptured. Probably the most rational treatment is to rupture the cyst at the time of diagnosis and to inject 10,000 units of a chorionic gonadotropic hormone subcutaneously or 2,000 units intravenously. If the value

of the patient justifies the cost, examine once a week. If not, examine in a month and repeat treatment to establish regular estrum.

Trichomoniasis. Trichomonad infection was not discussed under abortions because many of those that occur are unnoticed. It is discussed under irregular heat periods because that is one of the most common symptoms. When cattle are being bred and then return to heat in 30, 60 and 90 days and the incidence of pyometra with vaginitis is noted, trichomonad infections should be suspected. Diagnosis depends upon finding the organism, and treatment consists of suspending all breeding for 60 to 90 days, after which cows may be artificially inseminated and given individual treatment.

Cows That Are Past Due in Calving

When cows are past due, a mistaken breeding date must be considered and the correct state of gestation ascertained. Next, the entire list of causes for anestrum are reviewed. The most likely reason is that the cow either did not become pregnant when bred or that she lost her calf for some reason and then went into an anestrous state.

The last thing the writer expects to find is pyometra. However, it is very prevalent in some areas. Pyometra is usually associated with trichomonad-infected herds, and under these conditions it is not uncommon to find a greatly enlarged uterus containing a great deal of pus. Diagnosis in those patients having a closed cervix and a suspected accumulation of pus must be carefully evaluated and differentiation made between a gravid uterus and one filled with infective transudates. Treatment for pyometra is directed toward evacuation of the uterus and the establishment of the normal heat cycles. This is accomplished by expressing the corpus luteum or by administration of di-ovocylin. If the uterus is greatly distended with pus, the ovaries may be out of reach. In this case, cervical forceps applied to the cervix will make possible bringing ovaries within reach.

Cows That Come in Heat with Regularity but Do Not Conceive

Vaginitis, persistent hymen, fibrous bands across the cervix, cervicitis, catarrhal metritis or endometritis, neoplasms, adhesions in and around the ovaries, salpingitis, occluded fallopian tubes, thickened and shortened broad ligaments, delayed ovulation, nutrition and obesity are some of the known causes of this type of infertility.

Catarrhal vaginitis is quite common in cattle. The mucous membrane of the vagina is light red in color and a slight discharge usually is present. Oftentimes the catarrhal vaginitis is due to an endometritis or a secreting cervicitis. If this occurs, the uterus and cervix should be irrigated with solutions of salt, soda, acriflavine, or potassium permanganate. These douches should be given by the pail full with the aid of the stomach tube and pump. The end of the tube should be directly on the cervix so that all of the exudate can be removed. When salt or soda are used, the cow can be bred two to three hours after douching. It is a good practice to repeat treatment once or twice a week and again the day the cow is to be bred. Acriflavine jelly (1%) applied to the cervix and entire vagina once or twice a week for two weeks will often give gratifying results.

Granular Vaginitis

Granular vaginitis is of two types. One is highly infectious and troublesome; the other is not. Infectious granular vaginitis can be traced to certain bulls or breeding practices. In some herds, this disease is not uncommon in virgin heifers, pregnant cows, pregnant heifers, and problem animals. The diagnosis is fairly simple; as granules can be felt with the finger in and around the clitoris. Prognosis without treatment is a gamble because vaginitis may or may not be causing the sterility. Treatment consists of twice weekly dusting with silver picrate or with applications of acriflavine jelly.

Trichomoniasis should be suspected in persistent cases of vaginitis with pyometra. A persistent hymen or thin band of tissue is often seen in shy breeding heifers. Some have a fibrous band of tissue across the cervical opening. The probable cause of the sterility is mechanical, resulting in a local condition unfavorable to sperm. Either of these seldom occurring conditions are amenable to treatment. Simply insert the finger around the band and break it. If the band of tissue is too strong for the fingers, a long pair of scissors serves very well to divide or remove such tissue.

Cervicitis in some animals can be detected upon rectal examination, and others show only a slight red cervix with some swelling and a slight purulent exudate. Many cases are due to endometritis in which case the uterus should be treated. In mild cases of cervicitis, the cervix and vagina can be douched as recommended for catarrhal vaginitis. In other cases,

it is well to paint the cervix twice weekly with a glycerite of iodine preparation consisting of a mixture of one part Lugol's solution of iodine to eight parts of glycerine. Silver picrate or use of acriflavine jelly are recommended also. If the first or second cervical fold is partially or wholly protruding into the vagina, it is often necessary to amputate the protruding portions. This is done by simply grasping the cervix with a pair of cervical forceps and removing the protruding portion with a pair of curved scissors. After care consists of douching twice a week and breeding at the next heat.

Catarrhal metritis or endometritis is diagnosed most frequently in old cows that come in heat regularly, have been bred several times, and in which little if any pathology can be detected. These cows usually have a soft, flabby, atonic uterus. Treatment by uterine injections of aqueous penicillin, 200,000 to 500,000 units, dissolved in 40 cc. of water, solution of a suitable sulfonamide, or antibiotic solution. Ty-sin®* (solution of tyrothricin) gives the best results when used as the diluent, and may be injected into the uterus at time of heat with the aid of a special catheter and cervical forceps.

Adhesions, salpingitis, occluded fallopian tubes, thickened and shortened broad ligaments can, for general purposes, be classified as the same condition. They usually follow a history of retained placenta with resulting infection, but are not rare in virgin heifers. Oftentimes the ovaries are very close to the horns of the uterus and the customary free movement of the ovaries when picked up by the hand is absent. This condition can be either unilateral or bilateral. Treatment is more or less useless although ovarian and uterine massage might be of some benefit. It is the writer's practice to continue breeding until the owner either sells the cow to the butcher or she becomes pregnant. It is the usual thing for the animal to continue to be a good breeder after freshening if and when she conceives.

Delayed ovulation is a common occurrence, according to the literature, but from a practical angle the writer cannot see how it is correctly diagnosed. Several of the hormones that are offered for this condition have been tried, but do not seem to have helped a great deal.

Nutrition and obesity probably account for much infertility, and the most common deficiency from a nutritional angle is probably not enough feed. It is a known fact that trace elements play an important part, and that conception rate is lower in animals deficient in phosphorous. The same can be said about obesity. Animals too fat, especially those that have been on the show circuit, have trouble coming in heat and conceiving. Most of this is experienced in heifers, but it is not uncommon in adult cows. When a veterinarian treating infertility is experiencing trouble in what he thinks are undernourished animals, diet should be investigated carefully, and adjusted. On the other hand, animals that are too fat can be put on pasture and after a few months they will often conceive. Malnourished animals will respond in a hurry, but obesity takes weeks or even months to correct. Probably the thyroid gland plays a role in this type of temporary sterility, though much remains to be learned. Results with thyroid therapy have been discouraging.

Those patients exhibiting obvious symptoms enabling positive diagnosis respond to treatment. Functional sterility without observed pathology presents the knottiest problems. Weekly or biweekly injections of 1 mg. of diovocylin have helped in a few cases. These small injections have been given until the vulva begins to swell and until some extra redness is noticed in the vulva or vagina. The animal should be bred on the next heat period and on the succeeding periods, if necessary. Occasionally one produces cystic ovaries with this therapy but again chorionic gonadotropic hormones correct the cysts. Another good point to fall back on is soda douches a couple of hours before breeding, or to massaging acriflavine jelly into the entire vagina, from the cervix to the lips of the vulva. This massage often ends with a conception on the next breeding. Last but not least, do not forget the penicillin injection into the uterus in old cows that have had a few calves. It will work many times when no apparent infection is present.

Infertility is a challenge. We are constantly being confronted with statements such as feed them, if they are in poor condition; starve them, if they are too fat. Sexual rest is one of the most important phases of treatment.

▼ ▼ ▼

Modern-day veterinary science has an effective answer to most swine disease problems. The difficult phase of this type of practice is to educate swine owners to modernize their husbandry and consult their veterinarians regarding disease problems rather than patronize nostrum peddlers or money-hungry druggists. —*A. H. Quin, D. V. M.*

®*Jensen-Salsbery Laboratories, Inc., Kansas City, Mo.

Sludged Blood*

MELVIN H. KNISELY,† Ph.D., Charleston, South Carolina

ALL, or almost all, of the medical thinking of our age might be classified under one or more of the following basic questions:

1. How is the body constructed? (anatomy).

2. How does the body function? (physiology, biophysics and biochemistry).

3. What can go wrong with it? (pathologic physiology, biophysics of disease, biochemistry of disease and, finally, if treatment is unsuccessful, morphologic pathology).

4. What can we do about it? (therapeutics and surgery and, when we know enough about a disease, applied epidemiology, preventive medicine, vaccination, preventive serums, quarantine and sanitary engineering).

In view of the above, three fundamental questions should now be asked about sludged blood:

1. Is there such a thing as sludged blood?

2. If so, what is it doing to the bodies of animals and men?

3. If sludged blood damages the bodies of domestic animals and people, what can we as physicians and medical scientists do about it?

These three questions should, I feel, be kept in mind constantly to orient our studies and to guide us in attacks upon the problems presented by the various types of blood sludge.

Currently, there are three major groups of problems:

1. To get as many people as possible to study and *understand* the meaning of the various types of sludged blood.

2. To analyze the chemical and pathologic mechanisms of sludge.

(a) How are the various types of sludge produced?

(b) What is the composition of each of the various sticky precipitates which in different diseases and hosts cement various morphologic elements of the blood together?

(c) What else can we learn about how each type of sludge damages the body?

Doctor Knisely's presentation on this subject was illustrated by well prepared technicolor motion pictures, which graphically demonstrated normal and abnormal flow of blood elements in the capillaries of living tissue. These portrayed with marvelous clarity and distinctness, the phenomena of the development of sludge, masses, and aggregation of cellular elements.

Doctor Knisely's comments were largely explanatory during the course of showing the film. Readers are referred to Postgraduate Medicine, 10:15 (July), 1951, for methods employed in research, and a comprehensive reference list.

3. To devise (a) adequate measures for preventing the formation of a sludge, and (b) adequate therapy causing the masses of each type of sludge to break up into individual blood cells again.

The attempts at therapy may follow two courses:

(1) Logical attempts to devise specific chemical therapy after we have analyzed the mechanisms which produce the sludges. The analyses may very well provide clues which will help devise competent chemical therapy.

(2) The other approach is empirical, that is, to test every drug which is now available and follow leads which develop from such preliminary tests. Thus far, it has been found that quinine and atabrine® dihydrochloride each cause the breaking-up of the masses of sludge in rhesus monkeys with knowlesi malaria.** Also, heparin is being tested as will be noted later in this paper.

The following material is designed mainly to introduce the reader to the literature on intravascular agglutination of the blood or sludged blood. An attempt has been made to make this introduction comprehensive.††

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*Reprinted from An Annotated Bibliography on Sludged Blood, by Melvin H. Knisely, Ph.D., *Postgraduate Medicine*, 10:15 (July), 1951, by permission of the editors. Subject of paper presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 29-30, 1951.

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**See Knisely, *et al.*, Knowlesi Malaria in Monkeys. *Jour. Natl. Malaria Soc.*, 4:285 (Dec.), 1945.

††It is becoming increasingly necessary to have as complete a bibliography as possible, a listing of papers which present some one or more aspects of the developing ideas about healthy normal circulation and the pathologic circulatory disturbances which follow various types of intravascular agglutination of the circulating blood.

For a while at least, we hope to keep such bibliographies moderately up-to-date. There are numbers of papers which we have not found, shown by the fact that various authors keep turning up new references. Further, as continued research

Most of the more relevant papers are easily available. Obviously, it is not possible to summarize the total available knowledge in a very short paper. Further, there are many different points of view. Various authors are in sharp disagreement.

Definitions of Terms

Development of the Term, "Sludged Blood". Various persons have asked members of our laboratory what we mean by the term, "sludged blood" or why we ever used this particular phrase for "intravascular agglutination of the circulating blood." The term arose, in part, as follows:

From Webster's New International Dictionary, ed. 2, p. 2370, 1948, Springfield, Mass., G. & C. Merriam Co. (one of the major authoritative dictionaries of the English language):

"Definition: SLUDGE, n [cf. Slush, Slutch] 1. Mud; mire; esp., a muddy deposit on tideland, a river bed, etc.; ooze.

2. New sea ice forming in thin detached crystals; slob.

3. A muddy or slushy mass, deposit, or the like. Specif.: a) the precipitated solid matter produced by water and sewage treatment processes. b) mud from a drill hole in boring. c) muddy sediment in a steam boiler. d) ore dressing. (1) = Slime, n.

4. (2) Waste from a coal washery. e) settlings from oils (esp. mineral oils), as the mixture of impurities and acid that settles out in the refining of petroleum by sulphuric acid. f) a mixture of lime and water, as that in a gas-producer pit."

The word "sludge" is also used for liquid mud. And in the United States of America it is frequently used for the muddy, slushy precipitates formed in motor oil, which accumulate in the bottoms of automobile crank cases.

"Sludge" is thus a suspension of solid or semi-solid particles in a fluid which itself may or may not be a truly viscous or Newtonian fluid, the whole making up a material much more difficult to pump through tubular pipes than is the isolated, liquid part of the suspension. "Agglutinated blood" has similar physical properties and is also more difficult to pump through small vessels than is fluid blood. Hence, the use in our laboratory of the term, "sludged blood."

Further, the term "sludge" used exactly as indicated is one of the terms used by engineers in describing the known physics of the flow of suspensions through pipes. Thus, one great value of the use of the term sludge is that it connects the biologic literature and the engineering literature which we as physicians and physiologists must begin to understand in order to appreciate fully how sludged blood damages the body. For instance, as a small introduction to relevant engineering knowledge, see Babbitt, H. E., and Caldwell, D. H., Laminar Flow of Sludges in Pipes with Special Reference to Sewage Sludge, (Univ. Illinois Bul. 37:no. 12 [Nov. 14] 1939) which has an excellent historical engineering bibliography and, perhaps more important, the book, Industrial Rheology and Rheological Structures, by Henry Green (New York, John Wiley & Sons, 1949).

Two more definitions are necessary in preparation for subsequent material:

The Basic Masses of a Sludge. By definition, we are calling those masses of agglutinated blood cells which *do not break up as they pass through* the long, progressively narrowing cone-shaped arterioles and cylindrical capillaries, the "basic masses" of a sludge, usually abbreviated, particularly in conversation, to "the basics."

"Aggregates" of Basic Masses. The second type of mass consists of cohering aggregates of basic masses. These aggregates are usually considerably larger than the basic masses of which they are composed. The aggregates *do break up* into their component basics as they (the aggregates) are forced down through the cone-shaped arterioles, etc. Each such aggregate *breaks up* into its component basic masses when it passes through an arteriole and/or capillary. In many patients, the basic masses so released reform into new combinations, into new aggregates, as they are carried into widening venules in which the blood is flowing slowly.

These large, relatively soft aggregates are frequently called "charge aggregates." High-speed motion pictures taken at 64 frames per second in our laboratory clearly show that the large aggregates are present in the arterioles in at least some experimental pathologic conditions. Further, trained observers can easily observe charge aggregates in the arterioles in many human patients suffering from different diseases. Under ordinary conditions of direct microscopic observation, it is very easy to see charge aggregates in small venules. Hence,

progresses, papers may be published which we do not find. Hence, if and whenever you find articles on these and related topics, we would deeply appreciate it if you would send the references to us. It is now planned to reissue these bibliographies or additions to them from time to time (at least for a while).

they are most frequently seen in small venules and observers with but minimal experience often see nothing but the large charge aggregates in venules. It requires good lens systems and illumination, and usually some experience in the microscopic study of living tissues, to observe the charge aggregates passing rather rapidly through arterioles and to study the basic masses passing through and forcibly bulging the terminal arterioles and capillaries.

The scholar will wish to keep the definition of a sludge in mind, and to separate sharply the differences between basic masses and the charge aggregates during subsequent studies.

A Statement of Principles of Both Normal Anatomy and Physiology and of the Known Mechanisms Whereby Sludge Damages the Body (with Minimal References)

1. *Microscopically Visible Characteristics of Healthy Normal Blood and Vessel Walls.* (a) The shapes and dimensions of the vessels of the peripheral vascular beds constitute a perpetual bottleneck in the circulatory system.

(b) In completely healthy animals, and men, the erythrocytes are not agglutinated. Each red cell is free from the others, and they tend to repel each other slightly. In carefully handled tissues, even rouleaux are absent.

(c) Leukocytes do not stick *at all* to healthy normal endothelial vessel linings.

(d) The flow of unagglutinated blood is laminar or streamlined.

(e) Small vessels do not leak fluid rapidly enough to cause microscopically detectable hemoconcentration of the passing blood or tissue edema.

(f) In the living liver, where direct microscopic observations have been made, uncoated, healthy normal red cells are not ingested by stationary hepatic phagocytes.

(g) The flow in most 60 to 100 micra vessels is so rapid that individual erythrocytes cannot be seen.

2. *How Sludged Blood Damages the Body.* The five major known mechanisms are:

(a) The resistance of sludged blood to its own passage through the bottlenecks of the circulatory system forcibly reduces the rates of blood flow through all open vessels of the body. The larger and the more rigid the masses of which the sludge is composed, the more the rates of flow are decreased. This forcibly reduces the rates at which the oxygen and glucose of the blood can be carried to the endothelium of the walls of all small vessels of the body (anoxia or hypoxia) of the stagnant type. If the rates of blood flow are sufficiently slowed down for a sufficiently long time, this directly causes reduced rates of oxygen supply to the endothelium of most of the small vessels of the body. Anoxic endothelium *always* permits blood fluid to pass out through the walls of the small vessels. This acts toward causing (1) hemoconcentration of the passing blood, (2) edema of the surrounding tissues, and (3) reduction of the circulating blood volume.

(b) Agglutinated red cells are ingested and destroyed, at least in some pathologic conditions, in the phagocytic cells of the liver, spleen and bone marrow. The ingestion and digestion of the red cells by these stationary phagocytes directly decrease the numbers of red cells in the body. This acts toward decreasing the red cell count (that is, *causing* anemia) and toward *decreasing the circulating blood volume.*

Also, whenever these phagocytes ingest protein-coated red cell masses, each ingestion must remove a finite amount of protein from the circulating blood. The rapid ingestion of large numbers of red cell masses, each jacketed with finite amounts of protein, may very well be a major factor in the protein depletions which occur in many human hospital patients. For mechanism, see Knisely, M. H., Bloch, E. H. and Warner, L., Selective Phagocytosis. I. Microscopic Observations Concerning the Regulation of the Blood Flow Through the Liver and Other Organs and the Mechanism and rate of Phagocytic Removal of Particles from the Blood. K. Danske Videnskabernes Selskab, Biologiske Skrifter, Copenhagen, vol. 4, no. 7, 1948 (in English). If such jacketed masses contained specific immune proteins when phagocytized, this would waste large amounts of these exceedingly precious substances. Cf. Cannon, P. R., Chase, W. E. and Wissler, R. W., *Jour. Immunol.* 47:133, 1943; and Cannon, P. R., The Functional Significance of Specific Agglutinins and Precipitins. *Physiol. Rev.* 20:89 (Jan.), 1940.

Following severe thermal burns human patients frequently have protein deficiencies. Further, protein deficiencies occur in human medical and surgical patients. Thus one direction of investigation should be toward trying to find out at what rates proteins can be removed from the circulating blood by being adsorbed onto circulating particles, including red cells and red cell masses, and then ingested by the phagocytes of the spleen, liver and bone

marrow. The above factors may very well be quite important in initiating and maintaining protein deficiencies in human patients. See the small book, Protein Nutrition in Health and Disease (Chicago, American Medical Association, 1945).

(c) There is settling and sedimentation of masses of agglutinated blood cells out of the moving blood plasma during life. Under specific physiologic and physical conditions masses of agglutinated red blood cells settle to the lower sides of vessels. If the sedimented agglutinated blood cells later cement into a large mass, this forms a large thrombus. (Cinema-recorded.)

(d) If the masses of which the agglutinated blood cells are composed are sufficiently large, then they plug small vessels causing multiple minute embolizations and/or multiple minute thromboses.

There are sludges which consist for the most part of small basic masses with a scattering of larger basic masses; the latter, if not too large and rigid, often cause multiple minute *temporary* embolization. Each large mass plugs each arteriole it enters, and then squeezes slowly through.

Masses *stranded* in vessels are not circulating. Thus, by the volume of such masses, the *circulating* blood volume is decreased. Further, the permanent plugs dam up various numbers of pathways whereby blood could pass from the arterial system to the venous system. This acts toward decreasing venous return to the heart. Also, the multiple minute embolizations and thromboses obviously plug vessels which should conduct blood through tissues which themselves need to be nourished.

(e) Various degrees of reduction of the circulating blood volume caused by items listed in paragraphs (a), (b) and (d) initiate, almost certainly by way of the vasomotor system, intermittent, prolonged, controlled shutting-off of the arterioles, capillaries and venules in a selected series of tissues and organs.

Depending upon the physical characteristics of the sludge present, including such characteristics as the *sizes* and *degrees of internal rigidity* of the basic masses of which the sludge is composed, the statistical distribution of the sizes, that is, the percentage of large masses and small masses, etc., and the degrees of stickiness of their outer surfaces, these five sets of major known mechanisms operate, each to many different degrees of severity and in many different combinations, in different individual animals and persons suffering from different diagnosed diseases and pathologic conditions.

My Conception of the Future Veterinary Clinic*

ROBERT P. KNOWLES, D.V.M., Miami, Florida

This proposed clinic will take the form of a group practice in which from five to ten veterinarians will be associated. The physical plant will be group owned or individually owned with a lease arrangement. In addition to veterinarians, competent *x*-ray, laboratory, surgical, and nursing technicians will complete the technical staff.

This group practice will be brought about by two things; (1) demand of the public (that is, demand by the public for the superior service available in such an institution, once it is established), and (2) economic pressure on the veterinary practitioner. This agglutinization of practitioners will produce partial or complete specialization. We are already witnessing evidence of specialization in a basic form; small animal, large animal, poultry, public health, research, etc.

Advantages

1. Complete facilities.

2. Competent staff; both professional and lay, including the services of a business manager from which most veterinary establishments could benefit.

3. More leisure because of alternation of duties, etc.

4. Unquestionably, the standard of practice would be raised.

5. Greater individual remuneration, mainly because of less individual investment.

Disadvantages

1. Subjugation of individual personalities for the benefit of the group. Although this is sometimes a difficult feat, the trait of collectivism is one of the basic causes for national greatness.

2. Slightly increased cost to the public.

Ours is an infant profession. Progress is being made. We would all be wise indeed to prepare for this progress, to welcome it and to lend our individual and collective weight to an evolutionary process which I feel will make possible improvement of veterinary services to the public.

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* Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

Diseases and Surgery of the Eye*

W. G. MAGRANE, D.V.M., Mishawaka, Indiana

The epithelial and endothelial layers of the cornea control its water content. Damage to either of these layers leads to the taking up of additional water by the cornea, with resulting edema and loss of transparency (opacity).

Examination of the external eye is preferably conducted in a darkened room with the aid of a binocular loupe and focal light, and is always preceded by instillation of a topical anesthetic.

Enlarged orbital glands can be removed quickly, safely, and without hemorrhage, under local anesthesia, with a tonsil snare and Allis forceps.

In chronic enlargement of the membrane nictitans, surgical removal is resorted to only when all other methods of treatment fail.

Allergy plays an important role in edema of the conjunctiva, and may be a factor in hypertrophy of the membrane nictitans.

Trichiasis, especially in the Pekinese breed, is the direct cause of many cases of superficial keratitis and pigmentation of the cornea.

An electrocautery unit with epilation needle is used to destroy the unwanted lashes in trichiasis.

When antibiotics and associated treatments fail, *x*-ray irradiation therapy is the treatment of choice in chronic interstitial keratitis, pigmentary keratitis, spreading, and slow or non-healing corneal ulcers, corneal vascularization, and as an aid to the dissimilation of exuberant granulation tissue formation of the cornea.

Riboflavin is indicated in every case of vascularization of the cornea.

Keratomalacia (corneal sloughing as a result of vitamin A deficiency) is not uncommon, especially in the Pekinese.

The five outstanding manifestations of iritis are: (1) loss of glistening appearance of iris; (2) exudate of leukocytes into the aqueous humor; (3) loss of mobility of iris; (4) miosis (abnormal smallness of pupil); (5) lymph stasis in the cornea (corneal opacity or clouding).

The most important single measure in the treatment of iritis is to secure prompt dilation of the pupil by means of atropine or other suitable mydriatic.

Atropine is of value also because it paralyzes the ciliary body, relieving ciliary spasm, an important source of pain.

Focal infections, including teeth, tonsils, and prostate, are principal causes of iritis.

Cortisone is useful as adjunctive therapy in iritis.

The aqueous humor has marvelous powers of absorption of foreign material in the anterior chamber.

Surgical relief of prolapse of the iris through the cornea, is accomplished by snipping off the protruding portion flush with the cornea, instilling atropine and antibiotics, and bandaging snugly over closed lids. The bandage is not changed until the third day and the eye is kept bandaged for a total of seven days.

Bandaging of the dog's eye is easily performed and is well tolerated. Bandaging is of value for the purpose of immobilization, extra warmth, and prevention of infection.

To bandage, a sterile, human eye pad is held in place with two strips of tape at the outer and inner canthus, the tapes encircling the head. Stockinette or bandage is then used for reinforcement.

Pressure necrosis of the cornea will result from improper bandaging, *i.e.*, failure to have the lids closed.

Paracentesis of the anterior chamber is of real value in the treatment of iritis, for relief of hypopyon (pus in anterior chamber), and of hyphemia (blood in anterior chamber).

Following paracentesis, the new aqueous that forms possesses a change in antibody titer that is definitely beneficial to whatever the disease process involved.

It is most important to be able to distinguish between acute iritis and acute glaucoma, because the treatment of the two conditions is diametrically opposite.

Glaucoma is characterized by: (1) wide dilation of the pupil; (2) ejection and congestion of the bulbar conjunctival vessels over the sclera (episcleral vascularization); (3) increased intraocular pressure with bulging; (4) varying degrees of corneal opacity.

In nearly 100% of all cases of glaucoma, surgical intervention is required sooner or later.

A filtering scar type operation, if performed before irreparable intraocular damage occurs, offers an excellent means of reducing the pressure to normal, and retaining sight. The operation known as iridencleisis is being performed routinely with splendid end results.

If miotics must be resorted to in favor of surgery, flouropryl (Merck) has given the best results in reducing intraocular pressure.

Excerpts from slide-illustrated lectures presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, Oct. 28-30, 1951.

Surital Sodium Anesthesia*

C. BROCK, D.V.M., Pensacola, Florida

Surital® sodium is a short-acting thiobarbiturate recently developed by Parke, Davis & Company. It was first reported in veterinary literature by Reutner and Gruhzit in 1948. They found it to be an excellent surgical anesthetic of short duration in dogs and that when unforeseen surgical difficulties were encountered, prolonged anesthesia could be obtained by the administration of an additional one-fourth of the original dose. Since this early report, several studies have been conducted in private veterinary hospitals, as well as in clinics and institutions throughout the United States. Some of these studies have been published in the veterinary journals and several others are now in press. (See VETERINARY MEDICINE, 46:31 [Jan.], 1951 and 47:97 [Mar.], 1952.)

Preparation of Surital for Injection

Surital is supplied in sterile, rubber-capped bottles, each containing 1 gm. of the dry material. A 4% solution, which is usually employed, is prepared by the addition of 25 cc. of sterile distilled water to each bottle. Freshly prepared solutions are clear, yellow-amber color and should be used within one week after dilution. Absorption of CO_2 from the air brings about a lowering of the pH of the diluent, causing a precipitate to form. Solutions containing such a precipitate should be discarded.

Dosage and Method of Administration

Surital, like most barbiturates, usually is injected at the rate of approximately 1 cc. of 4% solution per 5 lb. body weight; however, since some animals require less anesthetic for optimum results, this agent should always be injected slowly to effect. Ordinarily the first half of the dose may be given quite rapidly, with the remainder given at the rate of approximately 1 cc. per minute until the desired depth of anesthesia is obtained. Injections of surital in dogs should always be made intravenously.

Brinker reported that this barbiturate was also an effective anesthetic for cats when administered by this route. Additional injections may be given if necessary. The writer has also used it on cats with excellent results.

Isolated reports in swine indicate that surital is an effective anesthetic when administered either intravenously or intraperitoneally.

Case Reports

Surital has been employed on 50 patients to date. These included sick and injured animals, in addition to surgical patients. Luxations and fractures have been reduced under such anesthesia. Tonsillectomies, herniorrhaphy, ovariectomies, tooth extractions, removal of neoplasms, intestinal resection, splenectomy and cesarean section have been performed, as also has ear trimming surgery. As with other barbiturates, older animals and those in poor physical condition require less of the drug to produce a deep level of anesthesia.

Tolerance and Toxicity

Surital is well tolerated. Several investigators have found that it produces an equally smooth and perhaps more rapid induction of anesthesia than pentothal®[1] sodium with fewer signs of excitement and more rapid recovery. It was estimated by Spence and Coakley that the potency of surital is approximately 1.5 times that of pentothal sodium in the dog. It accumulates more slowly in dogs than pentothal so that there appears to be a lesser saturation of the detoxification mechanism.

Woods demonstrated that this barbiturate is perhaps less, but definitely not more, toxic than pentothal, while others who have studied these agents have found that the former did not develop tolerance upon repeated injection. Wheeler, at Michigan State College, has completely anesthetized dogs with surital daily for several consecutive days with no apparent ill effects.

This drug has been used in 12 cesarean sections to date. It is understood that Doctor Brinker has also successfully used it in combination with *d*-tubocurare in several similar experiences.

Although surital produces excessive salivation in some animals, emesis is infrequent. Excessive salivation may be controlled by the use of 1/150 gr. atropine sulfate given a few minutes prior to the administration of the hypnotic agent.

Surital has also been used in dogs following the administration of either methadon,® a new analgesic, *d*-tubocurarine hydrochloride or morphine sulfate. Morphine may be used either concurrently with atropine or as the

*Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

®Parke, Davis & Company, Detroit 32, Mich.
®[1]Abbott Laboratories, North Chicago, Ill.

sulfate alone. When any of these drugs are used prior to the intravenous administration of surital, the dose is decreased to approximately one-half of the regular dose.

Summary

Surital is a short-acting barbiturate especially applicable to small animal surgery because of its ease of preparation, short duration and controlled phases of anesthesia, low toxicity, and lack of excitement stage immediately prior to anesthesia or at the time of recovery.

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Application of the Kingma Tube for Continuous Intravenous Therapy*

STANLEY C. WASMAN, D.V.M.,
Miami Beach, Florida

A technic for continuous intravenous injection without restraint of the patient is provided by the use of an intrajugular catheter, the Kingma tube.

This is a small, plastic tube, manufactured of material that is nonirritating to tissues and of such size that it will pass through the lumen of a 15 gauge needle.

Fig. 1

Use of the Kingma tube is both practical and simple. When properly applied, patients may receive continuous, slow-drip infusion over an extended period while having the freedom allowed by a comfortable cage. This

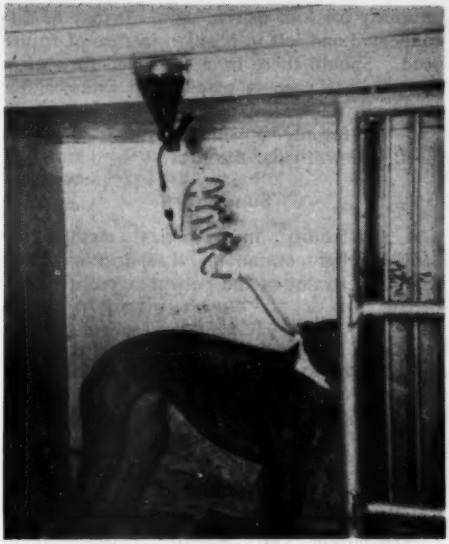

Fig. 2

allows the greater use of lifesaving fluids and reduces man hours spent in restraint.

Procedure is as follows: Area over the jugular vein is clipped close, scrubbed clean and painted with any suitable skin antiseptic. A 14 or 15 gauge needle is inserted into this vein in the direction of the flow of blood, *i.e.*, downward toward the heart. Next, a 7 to 10 in. length of Kingma tube, sterilized by placing in any accepted sterilizing solution, is threaded through the lumen of the needle into the jugular vein for a distance of 2 to 3 in. The needle is then withdrawn and slipped over the tube, leaving the tube in place. It may be inserted further into the vein or withdrawn at any time. It is secured in place by adhesive tape so that it comes up over the side of the neck and may then be connected to any standard intravenous apparatus by inserting a 22 gauge needle as far into the lumen of the tube as possible and connecting the hub of the needle to the tubing of the infusion apparatus. The rubber tubing of the infusion apparatus is fastened to a spring made from 22 gauge stainless steel wire. This wire is wound around a small bottle and taped in place long enough so that it forms permanent coils (fig. 1).

This spring is then fastened to a hook in the center of the top of a cage with the infusion bottle hung outside the cage so that it may be changed without disturbing the patient (fig. 2).

This apparatus may be left in position safely for as long as two weeks without harmful effects. The writer has frequently used it con-

*Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

tinuously for four or five days. It may be disconnected and left in position in case of future need. Should there be a restricted flow after the tube has been in place for a while, either moving it upward or downward in the jugular vein or forcing a small amount of fluid through it will clear the tube.

Summary

A satisfactory and practical method for administering continuous, slow-drip infusions without restraint of the patient is presented.

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Outline of Diagnosis of Canine Histoplasmosis*

CLARENCE R. COLE, D.V.M., Columbus, Ohio

History. Chronic, intractable cough, dysentery, weight loss and failure to respond to treatment.

Intradermal Test. Positive reaction is at least 5 mm. of edema in 48 hours at site of histoplasmin injection.

Confirmatory Diagnosis. (a) Culture *Histoplasma capsulatum* from blood, bone marrow, exudates and biopsy specimens.

(b) Microscopic demonstration of *H. capsulatum* in mesenteric node, liver, spleen, or lung biopsy.

(c) Necropsy findings: enlarged mesenteric nodes, pulmonary nodules, enteritis, ulceration of mucous membranes and hepatomegaly, cultural or microscopic identification of the causative fungus in the lesion.

Clinical Signs. Order of incidence among 31 cases studied:

Sign	No. of Dog
Pulmonary nodules on *x*-ray	28
Dysentery	16
Cough	11
Weight loss	11
Anorexia	10
Vomiting	10
Dermatitis	8
Irregular fever	8
Palpable mesenteric nodes	7
Dyspnea	6

Course. Acute, 6; chronic, 20; benign, 3; recovery, 2.

Communicability of Histoplasmosis. Histoplasmosis has been found in dogs, cats, wild rats, mice, skunks, and the kodiak bear.

Twenty-eight human household contacts of eight dogs with active histoplasmosis were studied by history, examination, chest *x*-ray, histoplasmin skin test, histoplasmosis complement-fixation and collodion agglutination tests. In addition, eight laboratory workers who were in long continued contact with these and other dogs with histoplasmosis, were studied in a similar manner. There was no indication that any of the studied group had the active disease. However, three of five dogs developed histoplasmosis while in cages adjacent to dogs with naturally occurring histoplasmosis, confirming the specificity of this test in the detection of active canine histoplasmosis. Two donor dogs maintained in the clinic for five years contracted histoplasmosis. The diagnosis was confirmed by culture or microscopic demonstration of *H. capsulatum* in tissues.

Known Portals of Exit of H. capsulatum from Infected Dogs. H. capsulatum has been found in ulcerative lesions of mouth, throat, esophagus and stomach; in lungs and bronchial fistulas; from nodes; in kidneys, bladder and urine; in ulcerative lesions of the bowel and in feces.

Thus, the caustive fungus may be isolated from soil, saliva, vomitus, sputum, urine or feces.

*Taken from annotated pathological display and notes from an address presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, Oct. 28-30, 1951.

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Liver Biopsy*

ROBERT P. KNOWLES, D.V.M., Miami, Florida

With the recent advances in knowledge regarding infectious canine hepatitis, liver biopsy in the living animal has become of practical importance to veterinary practitioners. The following technic was devised by Dr. C. E. Bild and the writer, following a general outline suggested by Dr. James Baker of Cornell.

The dog is placed in dorsal recumbency, with the legs outstretched, and held by an assistant. An area approximately two or three inches square is shaved or closely clipped on the ventral midline just posterior to the xyphoid cartilage. After application of a suitable skin antiseptic, skin, subcutaneous tissue, and musculature are injected with 2 cc. of 2% procaine hydrochloride solution containing 1:1,000 epinephrine. A dental syringe loaded with a dental carpule serves exceedingly well for this purpose, especially if the owner is

*Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

present, since the 26 gauge needle is not resented by the patient.

After anesthesia is effected, a sterile, no. 15 B-P blade is placed on the midline just posterior to the xyphoid cartilage. The blade, which is not attached to a handle, but held between thumb and forefinger, thus improving the tactile control, is now thrust gently through the skin, musculature and peritoneum with a puncture motion. In all subjects except those with unusually heavy abdomens, it will be found that a proper incision has been made when the enlarged portion of the blade rests on the skin surface. The blade is allowed to remain in situ until the biopsy needle is inserted beside it. The Ranfac biopsy needle, 14 gauge, with stilette, is preferred as the most effective of the several tried. The needle, with stilette in place, is now inserted through the skin incision directly beside the blade. As soon as the needle and stilette are felt to enter the peritoneal cavity, the blade is removed. The stilette should then be removed.

Since the gallbladder lies in this general area, slightly to the patient's right of the midline, and since the largest available liver surface is to the patient's left of the midline, the needle thrust should be made posterior and slightly to the patient's left, much in the same manner in which an ovary hook is directed during oophorectomy. As the needle, with stilette removed, penetrates the liver capsule, the operator will detect a crisp sensation much like that elicited when an inflated paper sack is punctured with a sharp instrument. The needle is inserted into the liver tissue for ½ to 1 inch; it is rotated back and forth to cut off the specimen, and then withdrawn. The liver biopsy specimen, which is a core of tissue the diameter of the needle and as long as the depth of penetration into the liver, will be found in the end of the needle. It can easily be removed by gentle insertion of the stilette. The tissue should be discharged directly onto filter paper so that excess blood is removed. From the section thus obtained, touch preparations or cell smears can be made [1, 2].

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Cotton Sutures*

JACK O. KNOWLES, V.M.D., Miami, Florida

With few exceptions, size 0 surgical cotton has been employed by the writer as buried suture for the last two or three years. Its use has three advantages and two disadvantages when compared with catgut.

Advantages

1. Since cotton is stronger than catgut, a smaller gauge suture is used, with attendant reduction of tissue injury.
2. There is less tissue reaction to cotton.
3. Cotton is cheaper. It may be purchased in large spools, cut into desired lengths, and autoclaved in sterile test tubes. Cost of cotton is approximately 10% that of catgut of equal lengths.

Disadvantages

1. Since cotton suture is not absorbable, technic must be sterile.
2. There is a tendency for tag ends of knots to work out through the skin and to act as a wick. Suture must be buried deeply.

Actually, the use of cotton as a buried suture dates back almost to the turn of the century and is accepted material for layered closures of all surgical wounds.

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Mastitis Due to Cryptococcus

Cryptococcus neoformans, a type of yeast which produces lung and brain lesions in man, was determined to be the infectious agent in a form of mastitis in a 200-cow dairy herd as reported by the chief of the Bureau of Animal Industry. Severe losses resulted from the infection. One animal suffered a lung involvement; while in eight of nine infected cows, the infection was confined to udder tissue and adjacent lymph nodes. The effect on the tissue of the udder was the same as that in man affected with Cryptococcus, but was different from the effect produced by the organisms commonly associated with mastitis.

Mastitis resulting from infection by this organism has not been reported perviously. No satisfactory treatment was found and measures taken were usual sanitary procedures, including the segregation of affected animals and the removal of severe cases from the herd.

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Diseases Of Poultry And Pet Birds*

E. F. THOMAS, D.V.M., Jacksonville, Florida

FOR the past 30 to 40 years, diseases of poultry have occupied a limited field in the practice of veterinary medicine. In most instances, this has been restricted to research laboratories, colleges and state livestock sanitary departments, and not to the general field of practice. Studies on the virus disease, fowl pox, began in the United States in 1914 and were the first intensive studies of poultry disease. Since that time, all states have initiated such studies of one kind or another. The finding of many virus diseases in poultry flocks has encouraged research workers to make intensive investigations into the virus field. New facts have been revealed which have added to knowledge concerning this class of disease-producing agents. Research has provided means of controlling ailments of poultry produced by viruses and has contributed much to the understanding of the behavior of such diseases in other animals and man.

It was from these investigations that the present day methods of producing the chick embryo vaccines had their conception. This method of virus culture provided the virologist with a tool comparable to the culture media of the bacteriologist. Fowl pox virus was the first to be propagated on the chick embryo in 1931. Today, three vaccines in common use for the control of poultry disease are cultured on embryonating eggs. Virus diseases of mammals, such as equine encephalomyelitis and canine distemper are controlled by embryo-grown vaccines.

When one is confronted with a list of the virus diseases of poultry, one begins to realize that specialized raising, with its resultant concentration of large numbers of birds in relatively small areas, could not have survived without effective procedures for the control and prevention of these diseases. Each of the four common virus diseases, fowl pox, infectious laryngotracheitis, infectious bronchitis, and avian pneumoencephalitis, have at various times seriously threatened the future of commercial production. Today vaccines are available against three of these virus diseases and a promising procedure has been introduced for handling the fourth. All are effective when properly employed.

Disease control in poultry cannot be assessed due to lack of suitable effective control measures. Practitioners have neglected a duty to this great industry by not offering services for diagnosing and prescribing for farm and commercial flocks. Diagnosis by qualified clinicians and guidance in the proper use of biological agents under various local conditions is within the province of the local veterinary practitioner. Doctor Beaudette, of New Jersey, has shown that improper use of pneumoencephalitis vaccine (N.D.V.) may explain poor results often experienced. In 1948, he and his assistants vaccinated 125,000 birds, and in 1949, the owners of these flocks did their own vaccination. When breaks occurred during the latter part of 1949 and early in 1950, they occurred in the birds which the poultrymen or their crews had vaccinated and not in the birds that these veterinarians had vaccinated a year earlier.

Florida veterinarians can recite similar experiences involving use of biologics by laymen in other animals, especially hogs. Lay vaccinators and poultrymen who are administering most vaccines to poultry do not appreciate the importance of technic. Frequently services are furnished without charge or the feed store may be "throwing in" the vaccine. These things all encourage the vaccinator to develop speed and the use of too small amounts of vaccine. This practice, coupled with the lack of knowledge concerning contraindications, has resulted in much dissatisfaction with good immunizing agents.

The co-existence of two or more diseases, or secondary disease, complicates the problems in poultry. These are facts the layman and poultryman with no training in the science fail to grasp. Industry leaders are encouraging the interest of veterinarians in poultry ailments. Some efforts have been discouraging. In 1931 while the writer was with the Florida Agricultural Experiment Station, a three day short course in poultry diseases for veterinarians was arranged. To the best of memory, the largest attendance was four practicing veterinarians one day. Response was so poor the idea was

*Presented at the 22nd annual meeting of the Florida State Veterinary Medical Association, Tampa, October 28-30, 1951.

dropped and never tried again.

In the writer's practice, the poultryman is given the same service as would be given a cattle or dog owner. At least a tentative diagnosis is made when the birds are examined and medication or control measures are prescribed which can be started at once. This can be done just as well in poultry as in other animals. Due to the splendid work which has been done in this field, it is possible to offer more, in many instances, than can be offered for treatment of other patients. Laboratory tests have been developed which are aids in establishing positive diagnosis, thereby making it possible to treat more specifically. It might be stated here that symptomatic treatment has no doubt been overlooked too often in treating poultry diseases. Frequently a little something may be added for the relief of symptoms which not only gives temporary relief but gives assurance to the flock owner or hatcheryman.

Sulfonamides provide many good therapeutic agents which are near specific in coccidiosis, infectious coryza and fowl cholera. Many members of this class of chemotherapeutic agents are used as supportive treatment and should be considered in all of the bacterial and virus diseases. Antibiotics are being used with good results in many of the bacterial infections and give promise of being of greater value.

Diseases of Pet Birds

It is difficult to define a pet bird since it may be any kind of a feathered creature. Within the past eight months, people have brought in parrots, parakeets, jay birds, whippoorwills, starlings, ducks, and chickens which are kept as pets.

It has been the writer's observation that these pets are most often affected with dietary deficiencies, external parasites, and the diseases most common to fowl. If there is one "don't" to be suggested to someone just beginning to handle diseases of pet birds, it would be "don't" look for some rare disease peculiar to the bird presented.

Improper feeding and handling will produce an untimely molt in pet birds just as it will in laying hens. Always look for lice where the bird is picking at the feathers and pulling them out. If lice are found, use a light dusting of a powder that contains benzene hexachloride (BHC), such as the dog flea or tick powders. In the molting birds, a little extra protein is indicated, as well as vitamins. Hard boiled egg yolk or a little fresh lean beef are good sources. Vitamins usually needed are A and D. Oiling grain feed with cod liver oil is a satisfactory method of providing these vitamins. If not taken by the bird in this way, a few drops can be given with a dropper.

Scaly leg in canaries will respond to sulfur ointment to which a little BHC flea powder has been added.

In handling pet birds, it is always a good idea to have the owner remove the bird from the cage. This is not so frightening to the pet and gives an opportunity to observe how the bird is handled by the owner.

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Challenge to Agricultural Research

In an address at the Southern Weed Control Conference, Atlanta, Ga., Dr. Byron T. Shaw outlined the demands for increased food supplies that may be expected by farmers and livestock growers. Increase in population and the drop in numbers of farm workers were pointed out. This situation means that higher yields must be obtained by improved practices. "We are now growing," states Doctor Shaw, "at the rate of 2,500,000 persons a year." This is equivalent to the population of a city approximating the size of Atlanta, Ga., added each two months. Census forecast for 1975 is 190,000,000.

For the record of the assistance of technology and research, the speaker referred to present day accomplishments as compared with those of 20 and 50 years ago. In 1951, 10,000,000 farm workers fed 155,000,000 people in the United States and provided for exports of agricultural products to approach a record for each farmer of supplying enough for himself and 14 others. This number doubles the dependents of the farmer of 50 years ago and is approximately 30% more than the figure established in the 1930's.

Increased efficiency on the farm and ranch must be developed further to meet increasing demands. This must come from knowledge of how to produce more per acre and also, how to reduce losses from insects and disease. In this, a challenge exists for researchers in all agricultural fields. Requirements for basic research on hybrid vigor illustrate the point. It is that extra vigor that is needed to raise yields of crops and improve efficiency of food utilization in meat animals. Production of meat is the no. 1 problem on the food front and inroads by disease that result in avoidable losses fix the position of responsibility of the veterinary practitioner.

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Inadequate nutrition is responsible for enormous losses in reproduction in cattle herds and sheep flocks.—*Nutrition News Bulletin.*

Immunization With Modified Living Virus With Particular Reference To Rabies And Hog Cholera

HILARY KOPROWSKI,* M.D., Pearl River, New York

DESPITE meager knowledge of immunological phenomena in viral diseases, it may be postulated that the state of resistance to viral infection may be induced by a spontaneous attack of the disease, by an intentional exposure to the original agent or its modified form, or by an injection of a vaccine containing inactive virus. In viral diseases, recovery from an infection is usually followed by immunity, which in many, though not all, instances persists during the lifetime of the exposed individual. It is almost impossible to ascertain whether this enduring immunity is caused by a single antigenic stimulus occurring during an attack of the disease, or whether it may be attributed to frequent exposures to homologous antigenic stimuli operating during the individual's lifetime. However, regardless of the actual mechanism of this phenomenon, authentic second attacks of measles, mumps, chickenpox and yellow fever are almost unheard of. Conversely, recurrences of common cold, influenza and herpes infections are common, although here a complicated factor of multiplicity of strains may play some role.

In order to engender protection against a virus disease in a non-immune individual, intentional exposure to the original agent may be attempted. In illnesses of mild nature, such as mumps, chickenpox and German measles, intentional exposure of young children by parents was practiced in the past and is still practiced today. Such a course of action, however, is impossible with diseases of severe nature, and in these cases, effective immunity may be induced by inoculation either with a modified living virus or with vaccines containing an inactivated virus.

In only a few viral and rickettsial diseases is it possible to immunize with properly inactivated agents, as for example, in equine encephalomyelitis, Japanese B encephalitis, rabies, hog cholera, canine distemper, the spotted fevers, and typhus fever. However, immunity obtained by inactivated viruses is of transient type, and repeated vaccinations may be required. In other words, protection engendered by killed viruses falls short of the mark set by the enduring immunity which follows convalescence from a natural disease. Moreover, certain of the viruses lose entirely their antigenic power when inactivated. This may be due to the nature of the virus itself, or to the fact that only small concentrations of antigenic materials are available prior to inactivation, as is particularly evident in the case of smallpox, dengue, and yellow fever. All of these facts prompted scientists in the past to search for viral agents which, while remaining harmless to an exposed person or animal, would engender a state of resistance paralleling that induced by a natural attack of the illness. This search, which is still conducted today with perhaps a sense of even greater urgency, has resulted in the discovery of modified viruses.

Modification of Viruses

Modification of viruses is not an art *per se*. On the contrary, in Andrewes'[1] words: "Viruses and other small parasites multiply so rapidly compared with larger hosts that there is immense scope for rather rapid change and adaptation by selection of suitable variants." In nature, numerous variants of the same agents exist, and adaptation of a virus to a new host in the laboratory certainly leads to a greater chance of modification. It is certain that scientists working today in different laboratories with supposedly the same strains of the same viruses are actually laboring under an illusion. Theoretically, these strains are identical; in practice, they represent variants created by some unknown change in the virus-host equilibrium which is entirely uncontrollable by man. For example, a study by Habel and Wright[2] on the antigenic differences between strains of rabies virus originating from different laboratories may be mentioned. All of the strains used in this study originally stemmed from the Pasteur virus.

Although adaptive modification of a virus is something known to occur frequently, it

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does not necessarily result in a decreased virulence of the pathogen except in very rare instances. Today, certain known laboratory "tricks" may be taken into consideration when embarking upon the adventure of attenuation of a virus, but it is impossible to predict the end result. As much is known about the intricate mechanism of the process of attenuation as is known about the nature of viruses. If and when the delicate parasite-host equilibrium will change favoring mutation of the virus with an orientation in the right direction, one can never foretell; and good fortune cannot be repudiated as an important factor. However, through the collective efforts of scientists, or even in spite of them, several attenuated strains of viruses have been discovered in the past, and more will most certainly be discovered in the future.

Living Virus Vaccines

There are 11* species of viruses known to be used on a sufficiently large scale in the practice of either human or veterinary preventive medicine for assemblage under the heading of living virus vaccines. Four of these were chosen for brief discussion as to their history, characteristics, and duration of immunity following vaccination. For convenience, pertinent data are incorporated in table 1. Modification of rabies and hog cholera viruses are more fully discussed.

Variola should be discussed first, since historically the accidental discovery of the immunizing properties of cowpox in man constituted the first conscious application of the use of modified living virus for immunization purposes.** Cowpox virus, the miracle-producing variant, was not man-made. Again through some unknown mechanism of natural selection, an agent recovered from a ruminant host was found to be nonpathogenic for human beings, and since it retained its antigenicity it was ideally suited for immunization. Jenner's contribution in this field was enormous since he foresaw possibilities which are finding their application today. The exact duration of immunity following vaccination is not well defined. In most cases it will probably end in four to seven years. So far as is known, vaccination will protect against exposure to any strain of smallpox. Although cowpox was originally encountered as a natural variant, in contrast to smallpox, it yields itself easily to further man-initiated adaptive modifications in numerous hosts. Again, however, the resulting variants are antigenically and immunologically indistinguishable[3].

Perhaps even more interesting is the history of the attenuated strain of Newcastle virus, of which several modified variants are known. These are actually isolated from chickens, a species which may be decimated when plagued by an outbreak of Newcastle disease. Thus, in this case, the natural host yielded variants, which are used in vaccination programs involving most parts of the United States and some other countries. There are two types of Newcastle virus most commonly employed in vaccination procedures. Which type is to be used in practice depends upon the age of the birds to be immunized. One type, represented by several variants, is applied by wing-web puncture in chicks older than four weeks. Immunity induced by this procedure is of a systemic type and, so far as is known, protects the bird during its lifetime.

Vaccination of one-day-old chicks represents a more complicated problem. Most of these birds show a high degree of passive immunity which cannot be overcome by wing-web inoculation. In order to circumvent this obstacle, another variant, the so-called Blacksburg strain, is administered by the intranasal route, inducing local active immunity superimposed upon congenital passive immunity of the bird[4]. Because of this immunological phenomenon, birds are protected for 12 to 13 weeks against exposure to virulent virus[4]. Thereafter, revaccination by the wing-web method is indicated in order to supplant the local type of immunity with a systemic type operative during the life of the bird.

While the modified strains of smallpox virus and Newcastle disease virus were encountered in nature, the viruses of yellow fever and African horse sickness, in contrast, were modified by man. Adaptive modification of the latter pathogens to existence in a new host resulted in the production of attenuated variants which are used today for mass vaccination of man and animals, respectively. Modification of the yellow fever virus was accomplished in a gradual fashion. In the initial stage, a viscerotropic virulent strain of virus was adapted to the mouse by means of serial intracerebral transfers[5]. The resulting variant acquired a high degree of neurotropism as evidenced by its uniform encephalitogenic

*African horse sickness, canine distemper, cowpox, fowl pox, hog cholera, laryngotracheitis, pneumoencephalitis (Newcastle disease), pigeon pox, rabies, rinderpest, yellow fever.

**It should be pointed out, however, that immunization against smallpox by artificial inoculation with the variola virus was actually practiced in ancient times, but the first recorded instance of variolation is that performed by Mr. Maitland on the son of Lady Mary Westley Montagu in the year 1717[6].

properties after intraneural inoculation into the rhesus monkey[4]. The same strain lost considerably its viscerotropic properties, and attempts were made to modify yellow fever virus to such a degree as to make it safe for immunization. This was accomplished by prolonged preparation of the virus in tissue culture. One of the resulting strains, the so-called 17 D strain, was cultivated in a culture medium consisting at first of minced mouse-embryo tissue, then of total chick embryo, and later of chick embryo minus the central nervous system[7,8]. This variant lost both its viscerotropic and neurotropic affinities to a considerable extent. Parenteral inoculation of rhesus monkeys resulted in a very mild systemic infection leading invariably to convalescence. Intraneural inoculation produced fatal encephalitis in only about 5% of the animals. The 220-255th tissue culture generation of the 17 D strain constituted the yellow fever vaccine[9]. For actual production purposes the virus is passaged in the developing chick embryo.

Enduring immunity results from vaccination against yellow fever, perhaps operative even for the lifespan of an individual. The six-year period is mentioned because field data to date cover only this period after vaccination[10]. Again, as in the case of pox virus and Newcastle disease virus, vaccination seems to confer protection against all strains of yellow fever encountered in nature.

Attenuation of yellow fever virus by means of cultivation in tissue culture of the chick embryo from which the central nervous system has been removed may, on many occasions, have given rise to thoughts that this procedure might be applied successfully to modification of other viruses. Some evidence to support this view was obtained in the case of West Nile[11] and Venezuelan equine encephalomyelitis viruses[12], which became less virulent for mice injected parenterally after prolonged cultivation in tissue culture. On the other hand, adaptive modification and attenuation of yellow fever virus were never reproduced in spite of numerous attempts using exactly the same procedures and technics as in the original work with the 17 D strain[13]. Thus, one may stress again that there is no way to predict that preparation of a virus in tissue culture will lead to its attenuation unless good fortune accompanies the investigator.

It may be pertinent at this point to discuss briefly the possibility of complications following yellow fever vaccination. The most significant failure episode occurred in Brazil when a group of persons vaccinated against yellow fever were found to be non-immune when exposed to a virulent viscerotropic strain. The cause of failure lies probably in the fact that the strain used for vaccination purposes—the 17 DD high strain—stemmed from a very high tissue culture passage (above 305)[14,9], and perhaps underwent further change, which resulted in the loss of immunizing properties[9]. If these speculations are correct, adaptive modification of a virus may lead overzealous workers in some instances to produce a strain not only devoid of pathogenicity for the original host, but also deprived of immunogenic properties. For instance, modified strains of fowl pox and laryngotracheitis viruses are of no value for immunizing purposes, and in immunization procedures against these diseases, the most virulent natural strains are employed, but are given by an unnatural route. Apparently, virus undergoing continuous passages in a new host should be tested not only for changes in its virulence but also for its antigenic properties.

Attenuation of African horse sickness virus followed the technics described for the yellow fever virus. Originally, two immunologically distinct strains of the virus were adapted to mouse brain and guinea pig brain[15]. Gradual attenuation of the strains was observed. It is

TABLE 1. Four Examples of the Use of Modified Living Viruses for Vaccination Purposes.

Disease	History of the Modified Strain		Duration of Immunity Following Vaccination
	Origin	Source	
Variola	Nature	Heterologous host (cowpox)	4 to 7 years
Newcastle	Nature	Homologous host	Lifelong (?)
Yellow fever	Laboratory	Tissue culture	< 6 years
African horse sickness	Laboratory	Mouse brain	8 years (or more?)

interesting that the strain isolated from a naturally contracted case of horse sickness became attenuated at much faster rate than the second strain, which was passed through 193 generations in horses and possibly became horse "fixed" before adaptation to rodents[15]. Today, mouse-brain suspensions containing living virus are used routinely for vaccination of horses, mules and donkeys. Although immunity following vaccination has been proved to persist in horses for eight years or longer[16], annual revaccination of animals in endemic areas is recommended[17]. This seems to be advisable since, in contrast to smallpox, Newcastle disease and yellow fever, African horse sickness virus suffers from plurality of immunologically distinct strains. Annual revaccination induces solid immunity against the minor antigens and the range of protection is thereby broadened[16]. In addition, while the present standard neurotropic vaccine contains seven different strains of virus and has been used successfully for many years in mass vaccination programs, its future protective value still depends upon isolation and identification of new strains of African horse sickness virus.

The four viruses discussed so far have one common characteristic—when they are inactivated, they are no longer capable of inducing enduring immunity.

Modified Living Rabies Virus Vaccine

In the case of rabies virus, it has been known for a long time that vaccines containing the agent in inactive form displayed immunogenic power. The search for modified living virus as the source of antigen for vaccine production was therefore not motivated by the absence of vaccines but rather by their shortcomings. It is not the purpose of this paper to discuss the latter subject, but it should be pointed out that neuroparalytic accidents and the relatively short span of immunity following vaccination constituted serious disadvantages in an effective antirabies vaccination program.

Interestingly enough, the natural, or so-called street-virus rabies, which is characterized by a long and variable incubation period and by the ability to multiply in nervous as well as non-nervous tissue (salivary gland), can easily be altered through a very simple expedient known since the time of Pasteur. This refers obviously to rapid intracerebral passages in some experimental laboratory rodent such as the rabbit or mouse. The result of the adaptive modification of street virus is the so-called fixed virus, characterized in the words of Johnson[18] by, "short incubation period (after intracerebral inoculation), wide dissemination in the central nervous system with consequent high titer, and a rapidly progressing, paralytic disease." The Pasteur strain of fixed virus maintained by serial passages in rabbits was used most commonly as the source of antigen for inactivated virus vaccines, with all of their shortcomings. And yet, potentially, living fixed virus could be used as well for vaccination of human beings and of dogs, since it was unable to infect either species by the peripheral route. On the other hand, the virus was uniformly pathogenic when introduced intracerebrally into warm-blooded animals, and in large dose caused the death of peripherally inoculated rabbits, guinea pigs, hamsters and mice.

For many years these facts, accompanied by the dread of laymen and professionals alike of the use of living virus vaccines in rabies prophylaxis, prevented the continuation of excellent work done in isolated instances by workers who had been able to eradicate rabies among animals vaccinated with preparations of living fixed virus[19, 20]. Fear of the use of living fixed virus for vaccination purposes had various causes. One was the general aspect of the natural disease with its very high mortality figures. The other cause was the belief pro-

TABLE 2. Comparative Pathogenicity of Two Strains of Rabies Virus.

Virus Strain	Inoculation Route	Results of Exposure of Animal Species					
		Hamster	Mouse	Guinea Pig	Rabbit	Dog	Man
Street	Intraneural	† † † †	† † † †	† † † †	† † † †	† † † †	?
	Parenteral	† † † †	† †	† † †	†	† † †	† † †
Flury	Intraneural	† † † †	† † † †	† † † †	†	‡	?
	Parenteral	†	‡	‡	-	-	-

† † † † Completely pathogenic.
† † † Highly pathogenic.
† † Moderately pathogenic.
† Slightly pathogenic.
‡ Questionable pathogenicity.
- Nonpathogenic.

fessed by some individuals that any type of modified rabies virus may revert to its dreadful forefather and become street virus *de novo*. There is not the slightest scientific basis for these apprehensions, and yet, in order to circumvent the widespread fear, the search was continued for methods to produce a strain of rabies still more attenuated than the Pasteur type of fixed virus.

A strain with such properties was found in the Flury virus isolated from the spinal cord of a human case of rabies, and adapted to brain tissue of one-day-old chicks by Johnson[18]. At the 100th passage level, the virus showed a marked reduction of pathogenicity for intracerebrally inoculated rabbits. It still retained, however, its virulence for dogs inoculated intracerebrally[21]. After 138 serial passages in one-day-old chicks, this strain of virus was adapted to the chick embryo[22] and has now been carried through 160 egg passages. Pathogenic properties of the Flury strain at the 40th egg passage, compared with those of a street virus of canine origin (N.Y.C. strain [23]), are summarized in table 2.

It may be observed that susceptibility of different animal species to intraneural inoculation of street virus seems to be uniformly the same. Differences may be noted, however, in susceptibility to parenteral (intramuscular) inoculation. The hamster is unquestionably the most susceptible animal to infection with rabies virus; next, the dog, the guinea pig and man are probably equally susceptible; the mouse and rabbit are least susceptible to parenteral exposure to street virus. In the case of the Flury strain, the hamster, mouse and guinea pig are uniformly susceptible to intracerebral inoculation, and the incubation period is shorter and mortality ratios more uniform than in the case of street virus.

Conversely, exposure of rabbits and dogs to intraneural inoculation with Flury strain yields results indicating marked loss of pathogenic properties of this strain for these animals. In numerous experiments only a small percentage of dogs inoculated intracerebrally with either 10^{-1} or 10^{-2} dilution of chick embryo suspension infected with Flury strain succumbed to rabies. In rabbits injected intracerebrally, a curious phenomenon, described by Levaditi[24] as "self-sterilizing neuroinfections", may be observed. Brain tissue of animals injected with high concentrations of infected material very rarely yields virus.

Susceptibility of man, dog and rabbit to parenteral inoculation with the Flury strain is nil. Only one mouse or guinea pig out of 12 animals inoculated intramuscularly with high concentrations of virus will become paralyzed. Susceptibility of hamsters to intramuscular exposure is perhaps greater than that of other species, but curiously enough, the recovery rate among paralyzed hamsters is high.

These data, supplemented by a large number of field trials, became the basis for the recommended use of the Flury strain as an effective method of vaccination of dogs. The safety of the immunization procedure may be judged by the fact that up to date more than 150,000 dogs have been inoculated without a single accident attributable to vaccination.

TABLE 3. Hog Cholera Virus: Effect of Serial Rabbit Passage on Swine Virulence

Rabbit Passage	Swine Virulence Tests of Rabbit-Adapted Virus Mortality Ratio	Challenge Tests* of Surviving Swine Mortality Ratio
9	2/2	
11	0/2	
12	1/1	
30	6/6	
50	4/4	
80	3/5	0/2
90	2/5	0/1
97	3/7	1/4
129	2/8	0/6
135	6/25	0/17
145	1/4	0/2
207	0/11	0/11
245	0/18	0/18
284	0/12	0/12

*1 ml. of 10,000 or more LD_{50} used for challenge inoculation.

In studies on duration of immunity, challenge of dogs with street virus two years after vaccination with the Flury strain brought down only three dogs out of 25 vaccinated. In comparison, of 19 dogs vaccinated at the same time with vaccine containing phenol-inactivated virus, eight succumbed to rabies. In the non-immune control group, challenge inoculation resulted in the death of 21 of 23 dogs[25].

Animals immunized with Flury strain resisted challenge with street virus strains not only of American origin, but also of those isolated in Central America, (vampire bat origin) Greece, and India. The Flury strain is antigenic only in its viable form; chick embryo suspensions containing high concentrations of inactivated virus are entirely devoid of immunizing power.

These are, briefly summarized, properties of a strain of rabies attenuated through adaptive modifications. Are these properties characteristic of the Flury strain, or will any strain of rabies adapted to the chick embryo become similarly modified and show similar antigenic

properties? The answer may be given in both the affirmative and the negative. Five other strains of rabies were adapted to chick embryo and two of these were more extensively studied. Pathogenic properties of strains passed through numerous egg passages were perhaps similar to those of the Flury strain. However, none of these can match the Flury strain in its broad antigenic properties[20]. On the contrary, the immunizing power of embryonic suspensions infected with the two other egg-adapted strains was found to be negligible. Although explanation of this phenomenon cannot even be attempted, it seems certain that outstanding immunological characteristics are inherent to the Flury strain.

virulent virus. These losses were attributed, following thorough laboratory investigations, to a variant form of the virus[21]. It was found that swine solidly immune following serum-virus vaccination were not affected by this variant. Crystal violet vaccines, on the other hand, failed to immunize swine against this variant virus [22]. Dale, *et al.*,[21] proposed a 50% increase in the antiserum dosage in serum-virus vaccinations in order to overcome the action of the variant virus.

Research in the direction of modification of hog cholera virus was therefore accelerated. It was foreseen that considerable difficulties would be encountered in obtaining man-initiated modifications of the virus because of its

TABLE 4. Comparative Results of Challenge with Variant Virus and Lederle Stock Virus of Pigs Vaccinated with Rovac

Exp.	Vaccine Lot No.	Rabbit Passage	Results of Challenge* of Pigs with Variant Virus** Vaccinates	Variant Virus** Controls	Lederle Virus Vaccinates	Lederle Virus Controls
A	7-3004-16	275	0/16	4/4	0/15	2/2
B	7-3004-18	276	1/8	4/4	0/8	2/2

* 1 ml. of undiluted infected blood used for challenge purposes.
** U. S. BAI 1949 variant SN-1.

Modified Living Hog Cholera Virus Vaccine

Search for a modified antigenic strain of hog cholera virus likewise was not motivated by the lack of vaccines, for immunization against hog cholera has been practiced since the year 1908 when Dorset, McBryde, and Niles[27] discovered that swine could be immunized by simultaneous inoculation of virulent virus and potent immune sera. The success of this type of vaccination, however, was obviously dependent upon many factors, and the use of this method was not without risk since foci of infection were always created in hog-cholera-free territories, and virulent virus lingered on premises on which such vaccination was practiced. There is also the danger of contamination of the virus with other organisms pathogenic to swine. In addition, a leukopenia is produced and dormant infections may be aggravated[28].

The shortcomings of these vaccines led investigators to search for other types, and the fruits of their efforts were the vaccines containing inactivated virus: crystal violet vaccine[29] and Boynton tissue vaccine[30]. However, dependable immunity could not be induced by these vaccines until two or three weeks after vaccination and the immunity was of such short duration as to warrant biennial revaccination. Furthermore, during the summers of 1949 and 1950, large losses occurred in swine during vaccination with hog cholera antiserum and very high degree of species-specificity. However, following many fruitless attempts at adaptation to other animal species, the virus was passed in rabbits and after it had been propagated for several serial passages, it was considered as adapted[28] to that species. At the same time, it was quite obvious that the leporine† strain at the early passage level was as virulent for swine as the parent porcine strain. In spite of that, it was decided then to continue the arduous labor of consecutive serial passages in rabbits hoping that the virus would in the end be "trained" in the right direction. In table 3, data summarizing the results of inoculation of swine with material representing different rabbit passage levels of the leporine virus, are presented.

It may be observed that, up to the 50th rabbit passage level, a 10% suspension of infected rabbit spleen tissue was lethal to all swine inoculated. From then on, a gradual process of modification seemed to take place and the strain lost its lethal properties somewhere between the 145th and 207th rabbit passage levels. The results of challenge inoculation with virulent virus of swine surviving injection of the leporine strain indicated that the modified virus retained its antigenic capacity.

Following these studies, vaccines were pre-

†Leporine: Of, pertinent to, or like, a hare. Lepus: The genus including most of the hares and rabbits. (Webster)

pared using rabbit tissue representing the 240-295th rabbit passage levels of the leporine strain. Field trials with a relatively small number of pigs confirmed the nonpathogenicity of these preparations and the vaccines were then used to immunize 10,000 or more animals[84, 85]. The results of these field trials fully paralleled those obtained in the laboratory. The virus was found to be completely modified and at the same time of high antigenic capacity. Immunization with this strain conferred protection upon the majority of vaccinated animals within three to five days after inoculation. It may be observed in table 4 that pigs immunized with rovac® (rabbit origin vaccine) were equally resistant to challenge inoculation of the so-called variant virus and the virulent stock strain of hog cholera virus.

Data on duration of immunity following inoculation with rovac are available only for the six months following vaccination and all of the vaccinated animals were found to be resistant to challenge inoculation at that time. Further information on duration of immunity will be obtained when vaccinated animals will be challenged one year or later after immunization.

If this modified strain of hog cholera virus is found to confer lifetime immunity upon vaccinated animals, it should play an important role in the control of the disease, and possibly in the not too distant future reach its ultimate goal—eradication of hog cholera.

Summary

The common properties and common differences of living viruses modified either in nature or by man are discussed. Although a rational approach is certainly necessary in planning an attack on adaptive modification of a viral pathogen, it should always be borne in mind that any number of attempts using all the know-how of past experience may end in frank failure if good fortune does not accompany the search.

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(*Continued on page 154*)

A Unique Type Of Radiation Therapy In Small Animal Practice

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RADIATION therapy has been employed by the authors for the relief of a variety of inflammatory, infected, traumatic, and degenerative conditions. It is based upon a fundamental principle of biophysics which holds that radiant energy of the solar spectrum from 3,100 A to 14,000 A accounts for all the clinical accomplishments of heliotherapy. These accomplishments have been most clearly established at the famous sun clinics in the Swiss Alps at St. Moritz and Leysin for over 50 years.

The superheated tungsten energy herein described, known as the heliotherm,* is a method of radiation therapy based on the artificial reproduction of this regenerative portion of the sun's wave lengths. This radiant energy, which has been employed routinely in the writers' clinic, delivers to the treatment area approximately 5.2 times the therapeutic energy of average sunlight between the ultraviolet wave length of 3,100 A and the infrared wave length of 14,000 A.

It exhibits no escharotic nor irritating action at either end of the spectrum. Although short-wave or erythematous ultraviolet is generated within the superheated tungsten bulb, the thin, soda-lime glass envelope of the bulb filters out undesirable or caustic radiation.

Radiant energy emitted by the bulb is conducted without appreciable loss through a clear, fused quartz rod to the treatment area. Here, again, the radiation is filtered of all nonpenetrating wave lengths of infrared (longer than 14,000 A) by the incorporation of an integral watercell in the fused quartz rod. Thus, little sensation of heat is experienced, even though the intensified therapeutic energy shown in curve A, figure 1, is applied directly to the treatment field.

Figure 2 indicates the marked increase in effective therapeutic energy secured by superheating the tungsten filament, which generates approximately 21 times the ultraviolet, 12 times the visible, and nine times the penetrative infrared, in comparison with a bulb of similar wattage heated to a lesser degree.

Thus the filtered radiation of superheated tungsten makes clinically available the maximum and optimum intensity of photothermal radiant heat (5,500 to 14,000 A), but also provides concomitantly the photochemical radiation effects (3,100 to 5,500 A), which together account fully for the recognized superior values of solar radiation.

The artificially produced energy (3,100 to 14,000 A) not only duplicates the full spectral continuity of the effective therapeutic range of sunlight, but also amplifies just this energy to approximately 5.2 times the average solar content. The clinical effectiveness of this amplified energy would logically exceed, both in point of time and scope, the effects of solar radiation.

Physiology

As Rollier[1] and others have consistently demonstrated, "every wavelength of sunlight is absorbed in varying depths of tissue," producing a combined photochemical and photothermal effect. Although the full blood chemistry changes have not been completely evaluated as yet, it seems plain, as Sonne[2] has stated: "No other action of heat on the organism has a similar effect."

The deep photothermal action alone can account for much of the derived benefit, as a result of the dilation of the capillaries and consequent increased blood flow. As Sonne has further demonstrated, the increased subcutaneous temperature heats the irradiated blood to a temperature far in excess to that of the highest endurable fever, yet with no increase of the general body temperature. These findings undoubtedly account for the present increasing medical interest in ordinary radiant heat generators in preference to other methods of heating tissue at a depth.

Obviously, such a subcutaneous temperature rise cannot be secured by the application of hot water bags, heating pads, etc. The localized

*The apparatus referred to in this article, and shown in use in the accompanying illustration, is known as helio-therm. Ultrad Laboratories, 208 Maplewood St., Watertown, Mass., are manufacturers and distributors.

application of filtered, superheated tungsten radiation is shown to be a practical and effective aid in the treatment of a variety of conditions in small animals.

The writers' investigation of this form of radiation therapy has followed an extensive evaluation of the method by many Boston clinicians in the specialities of ophthalmology, otolaryngology, orthopedics, oral pathology, and physical medicine.

It is significant that observations in veterinary practice parallel in close degree the cumulative indications of the above medical groups, and after treatment of an extensive series of cases, the writers concur in the report of Miner, Rounds and Karcher[3] that, "before and after the introduction of antibiotics, the method has proved to be singularly irreplaceable in a variety of inflammatory, traumatic, and infected conditions." Having described the physical characteristics of the method, principal clinical indications are outlined, in which the method has proved effective.

Infected Lesions

The method is of value in promoting rapid healing of infected wounds, ulcers and abscesses. Formation of epithelial tissue is often observed after the first treatment and the filling-in of healthy tissue proceeds more rapidly under irradiation than with other measures. Since no short-wave nor erythemogenic ultraviolet is emitted, the radiation therapy may be employed in ocular lesions without irritation or injury. In both otitis externa and media, the radiation method has proved to be of exceptional value. In stubborn cases which are resistant to antibiotics, it has become the method of choice. Deep penetration of this form of radiant energy seems to account for recoveries observed in the treatment of fistulas and discharging sinuses.

Ophthalmological Indications

Response obtained in the treatment of corneal ulcers in dogs has been spectacular in

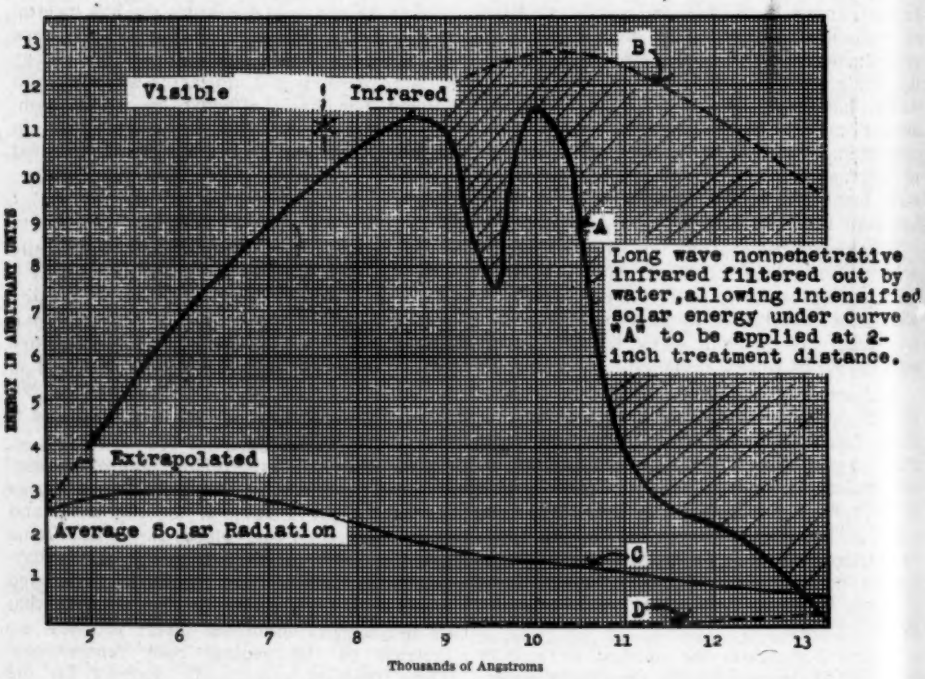

Fig. 1. Radiation from superheated tungsten. (Prof. C. Hawley Cartwright, M. I. T.)

Curve A. Superheated tungsten with 1" water cell, at 2 in.

Curve B. Same lamp without water cell.

Curve C. Relative intensity of sunlight.

Curve D. Relative intensity of a nonluminous source of infrared radiation which gives the same heating sensation as that of Curve A.

many cases. If affected animals are presented early enough, one three-minute treatment is usually all that is necessary to control infection and promote healing of the corneal wound without scar.

If, however, such ulcers are allowed to progress until deep-seated, two or three treatments at three-hour intervals usually effect satisfactory conclusion.

Conjunctivitis, keratitis and dacryocystitis respond to the radiation therapy with consistent uniformity.

Dr. James H. Emmerson (left) and Dr. Robert M. Nutter, shown applying heliotherapy to the alveolus after extraction of an infected tooth for the relief of periodontitis.

Corneal opacities, with the exception of the old, senile clouding, clear up by treatment through closed lids. The results in these are usually gratifying to the owner.

Postsurgical

As every practitioner handling pet animals knows, the cooperation of an animal following an amputation is practically nil. It has been found that a three to five-minute treatment of the heliotherm before suturing the flaps, and subsequent three minute exposures for two to three days will, in the majority of cases, prevent the most annoying nuisance of the animal tearing off the bandages and licking at the sutures, with consequent slow healing results, not well understood by owners. This pronounced analgesic effect, as well as the promotion of healing are accomplished without adjuvant treatment. Healing time is shortened.

Oral and Gingival

Recently a number of cases have been presented in which alveoli were deeply infected, with accompanying pyorrheal sloughing. These have involved canine teeth. Recoveries have been slow and drooling of bloody saliva regular for some time after extraction. Heliotherm is now used routinely immediately after extraction, directly into the root cavity, and the pyorrhetic areas before allowing the animal to come out of anesthesia. To date in all instances where radiation therapy was used, this unpleasant aftermath was avoided. As these animals are always old and the owner usually reluctant to hospitalize them, it has been found that when the animal is returned for examination, good healthy tissue is evident; salivation or sloughing not apparent.

Tumors or tumor-like growths involving the gums of dogs frequently reach a stage where surgical removal becomes necessary. However, unless there is excessive involvement of the gum tissue itself, good results are obtained by placing a tie at the base of the growth and allowing it to slough off (three or four days usually) and then using heliotherm treatment. Excellent results are recorded.

In the treatment of open joints, exposed bones, ligaments, tendons, fractures and contused tissues following automobile accidents, analgesic, healing and regenerative properties of radiation therapy have been demonstrated in an extensive series of cases.

Nasal and Accessory Sinuses

Sinusitis in aged cats is relieved by heliotherm therapy. It is more effective than any other procedure so far employed. The same is true in dogs. Intranasal irradiation has often produced marked results in chronic rhinitis in cats, as well as in tonsillar infections and glandular enlargements.

Radiation therapy has proved its value in the treatment of moist eczema, as well as in stubborn fungoid infections. The localized unit is useful only for circumscribed areas, but a larger instrument has now been developed that, no doubt, will prove to be a valuable method of therapy for more extensive lesions of large animals.

Interdigital Cysts

In the writers' practice this condition seems to be monopolized by Scottish Terriers and Irish Terriers. Either through lack of follow-up treatment or other cause, recurrence is frequent. Since using radiation therapy following incision, no recurrences have been experienced and, in some cases, animals referred in the initial, painful stage were promptly relieved and healing followed a single application of heliotherm. These results have been gratifying to both owner and clinician.

Conclusion

The regenerative action of radiant energy in the rapid healing of wounds and many stubborn infections has been consistently observed in a large number of cases over an extensive period of time. The authors believe that the use of this type of physiotherapy will soon be routine in the practice of progressive veterinary medicine.

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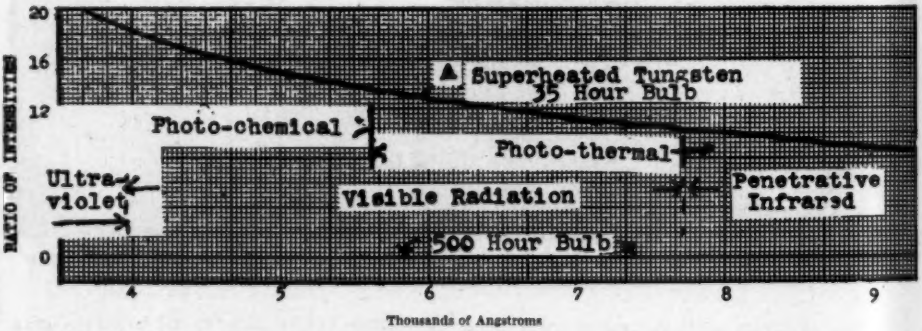

Fig. 2. Showing the marked increase in intensity of the three therapeutic divisions of the spectrum produced by superheating tungsten. (Prof. George R. Harrison, M.I.T.)

1. Penetrative infrared increased approximately nine times.
2. Visible radiation increased approximately 14 times.
3. Ultraviolet radiation increased approximately 21 times.

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Clinical Use Of Therapeutic Agents Containing Chlorophyll

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CHLOROPHYLL is found in various forms in a number of medicinal and cosmetic products today, and in only a limited number of such products does the chlorophyll content have any therapeutic value. Hence it seems logical to open this report with a statement that there is now available a chlorophyll which does have therapeutic effectiveness and which is, therefore, useful in veterinary practice.

This pigment, as it occurs in plant life, is in close association with the other plant pigments: carotene, xanthophyll, and plant resins. It is so firmly bound up in the chloroplast, and in turn in the cellulose fiber of the plant, that it can exert only minimum therapeutic effect in its natural form.

To obtain the forms which have demonstrated medicinal value, the naturally occurring plant chlorophyll is subjected to a complicated series of extraction and refinement processes. The phytol radical is removed, the nuclear magnesium is replaced with copper, and a water-soluble salt of the complex is produced. The highly refined and purified pharmaceutical product, (chloresium®) used by the author is correctly termed, "water-soluble derivatives of chlorophyll." It is to this specific form that the word chlorophyll refers when used hereafter in this report.

Numerous medical investigators[1-4] report that water-soluble chlorophyll ointment and solution have reduced the usual healing time in both clean and infected wounds and in long-standing indolent ulcers in man. Bowers[5] reports on a large and varied group of cases in a military hospital, in which this drug demonstrated distinct healing and deodorizing properties. Smith and Livingston[6] report that, in 1,372 experimental lesions in small animals, healing in 67% of chlorophyll-treated wounds was accelerated by 25%.

The literature indicates that water-soluble chlorophyll is entirely non-toxic, however administered. Taber[7] found that 3,000 mg. per kg. of body weight, administered internally to white mice, produced no toxic reaction. Other investigators, including the author, have noted similar lack of side reactions. Furthermore, chlorophyll, in itself bacteriostatic, has demonstrated excellent compatibility with the antibiotics[8].

In view of such background material, the possibilities of this drug in veterinary medicine are evident. The writer has had the opportunity to observe the effectiveness of water-soluble chlorophyll in a variety of conditions involving problems of tissue repair. Perhaps the most impressive results from these medications have been observed in ten burn cases.

These cases were first seen after periods varying from a few minutes to ten days following injury and included first, second, and third degree burns. In all cases treated with chlorophyll* the burns healed at least 25% faster than those treated with usual medications. Furthermore, it has been observed that resulting scar tissue in these cases was reduced around 50%, some cases healing with little or no scar tissue. This was also specifically noted in an earlier report by Schaffer[9].

Case 1. A three-year-old Cocker Spaniel was presented for treatment four days after receiving a severe burn. There was a malodorous, heavily encrusted necrotic area 4.5 in. in diameter directly over the hip joint. Under anesthesia, the necrotic tissue was excised. The only healthy tissue remaining was a thin muscle layer covering the acetabulum and head of the femur. When the dog walked, the entire joint action was visible. The wound was packed daily and kept wet with sterile gauze saturated in chloresium veterinary solution, and bandaged. Within ten days the wound was practically healed. At this time chloresium veterinary ointment was applied to the wound. Due to the adhesive quality of this salve, bandaging was not necessary, and complete healing resulted, without complication, in 18 days. Whereas some scar tissue

[8]Rystan Company, Inc., 7 N. MacQuesten Parkway, Mount Vernon, N. Y.

*The chlorophyll preparations used were supplied by Veterinary Division, Rystan Company, Inc. and are available to the veterinarian under the brand name chloresium® veterinary ointment and chloresium® veterinary solution.

remained, it is the writer's opinion that without chlorophyll the amount of scar tissue would have been much greater.

In our experience, wounds of either traumatic or surgical origin in cats and dogs also respond promptly to chlorophyll therapy. Used either alone or in conjunction with antibiotics, the water-soluble ointment and solution have decreased the time necessary for wound healing by at least one-third. Whereas the ability of this product to stimulate cell growth and thus wound healing has been reported in both the veterinary and human medical literature, it is common knowledge that antibiotics applied topically inhibit wound healing. Therefore, it has been the author's practice, wherever possible, to apply the ointment and solution topically and administer the antibiotics orally or by injection.

Results of chlorophyll therapy in the treatment of eczemas have been most encouraging and gratifying, and certainly the ointment and solution have a place in this aspect of veterinary practice. Thirty-one cases of chronic eczema of unknown origin, in both moist and dry forms, have been treated. Some of these were hospitalized, others treated at home. Eighteen to 24 hours after the first application of either the adhesive unguent or the solution, itching is generally eliminated. In a period of from four to ten days, all dogs and cats treated were completely cured, with the most startling results in dogs suffering from moist eczema. In these specific cases, the ointment was used exclusively, and all cases were completely cleared up in five days. Other skin eruptions have been successfully treated with the chlorophyll preparations.

Case 2. A four-year-old dog had been suffering from chronic furunculosis for over two years, during which surgery had been performed without success. Two areas were involved, one on each leg and each measuring 4 in. long by 2 in. wide. These were bandaged and a moist dressing of chlorophyll solution was placed in direct contact with the lesions. At the end of four days a marked improvement was noted. The adhesive chlorophyll ointment was then applied to the affected areas once daily, and bandaged. After 16 days, the dog was completely healed, and after a lapse of two months there was no evidence of recurrence.

In the treatment of pathological ear conditions, particularly those characterized by a purulent discharge and ulceration of the mucous membrane and underlying tissue, the value of chlorophyll ointment and solution has been proved[10]. Fast, uncomplicated healing in 40 cases of this annoying condition have been obtained, which can be credited to the tissue stimulating and bacteriostatic action of these preparations.

The introduction of chlorophyll-fortified dog foods[11] is of little interest to the veterinarian. It is only mentioned here to advise the practitioner that the chlorophyllins in these foods are added in such small quantities that they cannot, therefore, be expected to do more than decrease or eliminate body and breath odors in normal, healthy dogs.

Summary

Highly-purified, water-soluble chlorophyll applied topically in either ointment or solution form has many uses in the everyday practice of veterinary medicine. In the treatment of burns, surgical or traumatic wounds, moist and dry eczemas and other skin eruptions, and in ulcerous pathogenic conditions of the ear, these preparations have proved remarkably effective in accelerating the healing process. End results have been excellent, and in particular, scar tissue has been reduced to a minimum. The water-soluble preparations are nontoxic and can be used freely in all animals, either alone or in conjunction with the accepted therapeutic agents.

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EDITORIAL COMMENTS

Outbreak of Foot-and-Mouth Disease in Canada

By the time this issue reaches readers, all will have been made acquainted with some of the fact relating to a confirmed outbreak of foot-and-mouth disease in the vicinity of Regina, Saskatchewan, Canada. Upon suspicion of the disease, Canada requested the USDA to send a representative to the infected area, and Dr. M. S. Shahan of the BAI assisted in confirming the diagnosis. It was subsequently reported that the disease in Canada is of virus type A and that 11 municipalities (counties), involving approximately 25,000 cattle, had been placed under quarantine. The infection is reported to have been identified on 22 premises.

Foot-and-mouth disease remains the greatest of all disease threats to our livestock industry. It is highly contagious, with a history of having occurred in great panzootics in many parts of the world and wherever a body of susceptible animals has been built up. Should it break out in this country and get out of control, meat food and animal byproducts conceivably might be reduced in major proportions.

Epizootics of the disease have been raging for some time in Europe and South America. In Mexico, no infection has been reported since last August, yet there is no assurance that the disease will not reappear in any of widely separated areas of central Mexico. The announcement of the Canadian outbreak further endangers United States livestock and attests the elusiveness and "tricky" quality of the causative virus.

Observations in Canada

Doctor Shahan reported on his return from a ten-day tour of the quarantine area in Canada that forces were being organized to carry out measures to contain and eradicate the disease.

Bitter cold weather and snow are presenting extreme difficulties. The first burial pit was dug through 5½ feet of frost in heavy soil. With the best engineering equipment, digging the first three feet required 30 hours; normally about five hours would be required. In addition, winter weather and snow drifts seriously handicap disinfection procedures and transportation.

Doctor Shahan described inspection operations as difficult. Inspectors are required to wear rubber clothing which must be disinfected with a lye solution when they enter or leave each ranch. In the bitter cold, outer garments become solid sheets of ice after each disinfection process.

The virus, as is well known, can remain dormant in a frozen state so that adequate disinfection cannot be completed until after the spring thaw.

Not all farms in the quarantine area have been inspected. No additional infected premises have been discovered since the original 22 were designated. Suspicious cases outside the quarantine zone are being investigated but spread cannot be determined until repeated inspections have been made. Evidence is available that the disease has probably existed in the area since early in December. Additional outbreaks are likely. It was not recognized earlier because of the mild nature of manifestations that were atypical and confused with vesicular stomatitis. As the virus passed from animal to animal and from herd to herd, virulence has increased and identifying characteristics become apparent. The source of the outbreak has not been determined and several possibilities are being investigated by Canadian authorities. The existence of human carriers is not being overlooked.

Rigid restrictions have been established to control the movement of animals and animal products, including milk and feed, to and from the infected premises within the quarantine zone. Road controls and disinfection stations for trucks are being set up to enforce these restrictions.

Efforts to prevent the disease from entering this country were begun as soon as the announcement was made that foot-and-mouth disease existed in Canada. The border was promptly closed to all Canadian imports of domestic ruminants and swine and the fresh meats from these animals, by official order in accordance with section 306 of the Tariff Act of 1930. Restrictions were imposed controlling the importation of other animal products and materials, such as hay and straw, that might be contaminated. Animals and meats that crossed the border before the ban was imposed are being traced. For example, one shipment of partially cured hams from a packing company in the area of Regina, Saskatchewan, has been traced and is being boned and processed to destroy any virus that might have been present. The fact that transportation routes, by truck and rail, often cross

and re-cross the Canadian-United States border adds to the difficulty in bringing movement of restricted products to a halt. Movements of these will be permitted for the present, under customs bonds and seals. This applies to shipments originating in Canada for re-entry, and for re-entry of United States consigned shipments through Canadian territory.

Influence of restrictions on supplies of meat available is not considered to be significant. However, it was learned from Service and Regulatory Announcements, issued January 1952, that 16,452 cattle were passed for entry at Canadian border ports during November 1951. During the same month, Canada exported to the United States 5,689,476 lb. of chilled and frozen fresh beef and 2,592,797 lb. of other meats.

Another influence is the action taken by laboratories which serve practitioners by providing laboratory assistance in diagnosis. It is understood that until further notice some veterinary biological concerns who provide such service to practitioners will refuse shipments of tissue specimens or blood samples as a safeguard against the introduction of the virus on the premises which might threaten production of biological products.

Defense Measures

Only vigilance and information give protection against foot-and-mouth disease. The Bureau, under the law, provides primary protection at our ports of entry. The great expanse of unpatrolled border as well as the unrestricted migration of wild cloven-hoofed animals create a problem. Neither susceptible animals nor fresh meat are allowed entry from any country where the disease exists. In this case, such action may not appear realistic and may prove a hardship to the economy of both the United States and Canada. On the other hand, temporizing with foot-and-mouth disease might prove a disastrous error.

Should the disease pierce our border defenses, the Bureau, working cooperatively with state livestock sanitary officials, would enter on a program of inspection, quarantine, slaughter of diseased and exposed tnimals, and disinfection of premises. Unfortunately, efforts to establish research facilities available in or adjacent to the United States mainland have been blocked for political reasons. However, the Bureau now has a trained group of veterinarians who, in an emergency, will serve as key personnel in any disease outbreak. Prompt reporting of suspicious cases is paramount and every practitioner should alert owners to signs suggestive of infection.

Costliness of Past Experiences

Foot-and-mouth disease has appeared in the United States in 1870, 1880, 1884, 1902, 1908, 1914, twice in 1924, and in 1929. It can happen here again. These appearances, except that in 1914, were of relatively short duration and limited to small areas. The cost of eradicating six outbreaks during the 20th century has been estimated at $8,000,000. to the federal government; loss to the states and indirect losses amounted to at least $174,000,000., according to release of the Department of Agriculture. Further experience has been gained recently through cooperation with Mexico. Such experience has been enlightening.

Hopefully, the outbreak in Canada will be confined promptly to the area now under quarantine.

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Pasteurization of Liquid Whole Eggs

An effective method of pasteurizing liquid whole egg has been developed by the USDA. The new method employs the type of equipment ordinarily used for pasteurizing milk.

Heretofore, the industry has not known the time and temperature required for heating liquid egg to insure a complete kill of Salmonella without adversely affecting the commercial usefulness of the product. Research work tested the effectiveness of pasteurization at various combinations of time and temperature. Tests demonstrated that a process in which a temperature of 140 F., which is just below the coagulation level, is held for three minutes, proved effective in eliminating Salmonella under commercial operating conditions. Functional properties of the resulting liquid egg were affected little and keeping qualities were improved.

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Rabies In Iowa

The Iowa Commissioner of Health, Dr. W. L. Bierring, reports that 404 cases of rabies in animals were diagnosed in 1951. Excluding cases reported by Polk County, the numbers among dogs, cattle and skunks were approximately equal. One case of rabies in man was reported in 1951, the first in Iowa since 1944.

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Weekly examination of the genitalia of cows will make possible recognition of the rhythm of the estrous cycle.—*P. M. Hinze, D.V.M.*

A.V.M.A. Convention, Atlantic City, N.J., June 23-26, 1952

Advance hotel reservations and sales of exhibit space for the A.V.M.A. Atlantic City meeting, June 23-26, 1952, indicate that this will be the largest veterinary medical convention ever held on either coast.

No definite prediction of the registration at Atlantic City has been made, but local plans are centering on a figure of 2,500, with provisions for expansion.

There will be no shortage of first-class hotel accommodations, although early reservations are urged for those who want choice rooms in the immediate convention area. Even those who decide at the last minute to attend the meeting will have no difficulty in getting good accommodations, according to the city's well-managed Convention Bureau.

The scientific program, now in final stages of preparation, shapes up as one of the best ever assembled. Newest and most significant developments of the past year will be described by well known speakers, with closed-circuit television being utilized for clinical and surgical demonstrations. Again this year, Allied Laboratories, Inc., and Radio Corporation of America are sponsoring the television feature in cooperation with the Committee on Program.

Livestock Losses Intolerable

Judging by past experience, 35% or more of the spring pig crop will not survive to market age. One of five calves dropped (20%) will die before attaining the age of six months. Poultry losses will aggregate 10% of the chicks and 15% of the poults hatched before they reach market age. This great loss is unnecessary.

Factors responsible include poor management, inadequate nutrition, and disease. Application of knowledge gained by study can reduce the annual losses of young stock. Such reduction means additional profits to producers and lower cost to consumers.

Veterinarians have a vital role in preventing mortality and unprofitable slow growth and gains, and have a responsibility to producers. This includes institution of disease control programs and advice in management and nutrition designed to reduce waste and enable farmers to realize profits from livestock operations.

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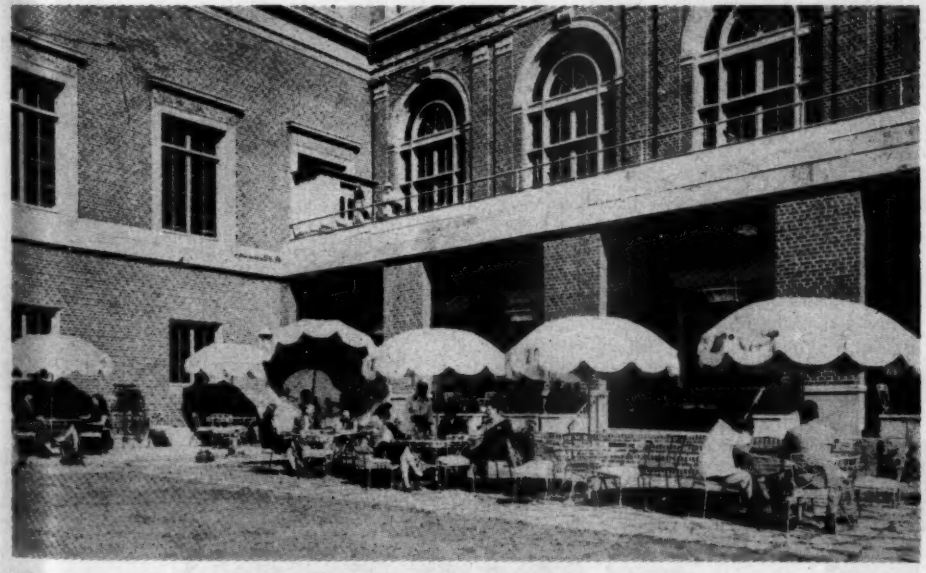
Sanitary husbandry practices, placing nose rings in pigs, and confinement of swine in good pastures are the most practical points of management for the control of lungworms. Keep pigs from old wallows and infected sources of drinking water.—*A. H. Quin, D.V.M.*



Popular summertime spot is the sidewalk cafe at the Ritz-Carlton Hotel, one of the headquarters for the 1952 convention. Visitors are promised many fine relaxing attractions such as this to add to enjoyment of a trip to Atlantic City in June.

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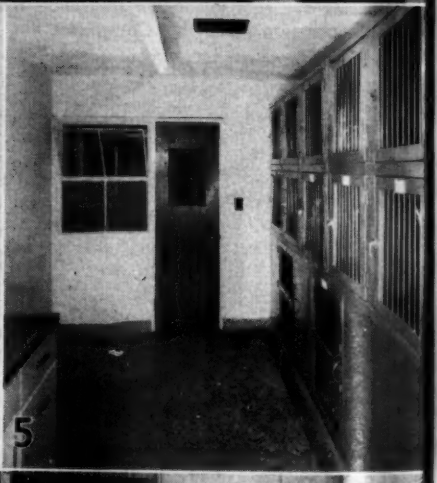

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Stark Animal Hospital

Pet owners, living in the vicinity where the fine animal hospital illustrated on the opposite page (located at 3900 Cleveland Ave., N.W., Canton, Ohio) has recently been completed, now have available superior facilities especially designed for the care of their animals.

Constructed of fireproof material throughout, this hospital has a floor area of 32′ x 135′, with living quarters on the second floor having dimensions of 30′ x 32′. Total investment, including equipment, approximates $100,000.

Reception room, examination rooms, offices and surgery are air-conditioned. Each ward is ventilated by automatic, forced air ventilators to assure air change twice each minute. Radiant heat in the floors of the hospital and apartment is equipped for zone control. Floors are terrazzo throughout.

Efforts have been unsparing to assure comfort of patients, and working efficiency. (1) Reception room and registration desk. Note wormy chestnut paneling; lighting is indirect. (2) Seats, upholstered in duran, an easily cleaned material, are built in along the entire outside (front) wall. (3) Exterior view. Each veterinary staff member is listed on an attractive parkway sign. Lot size is 70′ x 200′. Parking area is provided on the side. (4) Hallway extending from front to rear allows access to all hospital elements. (5) Ward. Each of seven separate wards has 15 built-in, stainless steel cages. Each ward is equipped with a dressing table having storage drawers. (6) View of surgery. (7) Examination room. Each room used for examination of patients has a small pharmacy. A complete pharmacy and laboratory is located between examination rooms.

Features not illustrated include a specially constructed, thermostatically controlled, stainless steel drier, kitchen, laundry, food carts, incinerator, heated quarters at the rear for large animal surgery, autopsy room, and other conveniences.

In the construction of this well planned and executed hospital, the owners have made use of successful precedents and given thoughtful study to what they required for adequate care of pets in their practice area. The use of stainless steel, terrazzo flooring, and other premium features was determined to be economical in view of the serviceability and reduced maintenance requirements.

Dr. L. K. Firth, KSC '33, Dr. R. C. Gonser, OSU '46, and Dr. R. B. Lind, OSU '46, make up the professional staff as equal partners.

American Animal Hospital Association Meeting, April 30-May 3, 1952.

All veterinarians are cordially invited to attend the sessions of the 19th annual meeting of the American Animal Hospital Association

Dr. Ralph E. Ruggles

(A.A.H.A.) which will be held at the Huntington Hotel, Pasadena, Calif., April 30-May 3, 1952.

Dr. Ralph E. Ruggles, practitioner of Moline, Ill., president of the Association, will preside at this meeting, which will feature national authorities on small animal disease problems. Surgical demonstrations and clinical procedures by telecast will highlight this year's program.

Dr. Wayne H. Riser, 5335 Touhy Avenue, Skokie, Ill., is secretary of this association.

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Sodium Silicate Predisposes Lambs to Urinary Calculi

In experiments with fattening lambs, at the USDA Beltsville, Md., Station definite evidence was obtained that the addition of sodium silicate to the diet increases the likelihood of urinary calculi. Although sodium silicate as such is never fed to animals, the salt is common in plants these animals are likely to eat. It was for this reason that tests with the product were conducted.

The theory of the action of silicate is that it disturbs utilization of other minerals such as magnesium, of which a marked increase was noted in the blood serum of experimental lambs. Furthermore, results of urinalysis suggest that the silicate intake influences excretion of phosphorus and magnesium, both of which were present in gross calculi found in the bladders of affected lambs.—*Annual Rept., Chief, BAI, 1951.*

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

From verbal discussions with veterinarians, one gathers that there is a feeling of uncertainty on their part regarding the merits of the newer hog cholera vaccines; especially the modified, live virus vaccine, modified by repeated passage, back and forth, through rabbits and swine. The swine owner holds the veterinarian responsible for results; therefore, the practitioner's anxiety. No one claims that serum and virus vaccination is the answer to safe immunization, and the dangers inherent in the use of a fully virulent virus are recognized. The following are some points raised in discussions with us relative to the use of the modified, live virus vaccines:

1. Since a recommendation is that the modified vaccine in general is not to be used until approximately ten days following weaning (this because, as we understand it, during nursing and for several days after being weaned the pigs may be measurably passively immune) what is going to give the pigs a strong resistance to hog cholera during this interval and doesn't this delayed vaccination with modified virus put the vaccination at a time when pigs are so frequently attacked by the various miscellaneous ailments that are so common a few weeks after being weaned?

2. In swine used for breeding purposes, frequently a year or more of age, does the modified, live virus vaccine give an immunity beyond the age required for marketing?

3. Since the modified live virus vaccine is a comparatively safe agent, that is from the standpoint of spreading cholera, is there danger that it may encourage promiscuous use by laymen with all the dangers attending such a program?

Until the foregoing questions can be cleared, there is going to be a good deal of hesitancy on the part of practitioners to desert the time-tried serum and virus procedure in favor of the newer products.

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The USDA Employee News Bulletin of November 7, 1951 in regard to antibiotics states that "At present more than 300 separately described antibiotics are known . . .; penicillin output last summer attained 25 to 30 trillion units per month. It remains the least toxic and the most generally useful of the antibiotic drugs."

In the Netherlands, according to Professor Seekles, director of the Laboratory of Veterinary Biochemistry, Utrecht University, ammonium lactate has given as good results as any other agent in the treatment of ketosis in cattle. Admittedly, it is not effective in all cases, but as a rule, it has been used with good results. Twice daily, the affected animal is drenched with a solution of 4 oz. of commercial ammonium lactate dissolved in a pint of water. Treatment is continued for at least five days; only rarely a few days longer. Whenever the blood sugar level drops as low as 20 mg./% the animal is also given one hypodermic injection of from 500 to 1,000 cc. of 20% dextrose solution during the first day of treatment. The theory supporting ammonium lactate treatment is that it improves the functioning of the liver with regard to the oxidation of ketone bodies.

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When pet birds, canaries, parakeets, parrots, etc., are to be medicated, the medicine should be in liquid form. The usual procedure is to take the bird in the left hand, with the thumb and index finger holding the head steady, and at the same time pressing against the commissures of the buccal region. An eye dropper containing the medicine is held in the right hand, and the free end of the dropper is also used to pry the beak open. The medicine is then carefully injected into the back part of the mouth. Carelessly done, it may cause some of the medicine to reach the air sacs, with fatal results.

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Kile, Rockwell, and Schwarz (*Jour. Am. Med. Assn.*, Feb. 2, 1952), report on their experience with neomycin in the handling of a variety of human dermatoses. In general, the best results were obtained following the topical application of an ointment containing 5 mg. (1,000 units) neomycin per gm. in a base of mineral oil, wool fat, and petrolatum. The pyogenic skin infections showed improvement in two to five days, though patients affected with hemolytic, streptococcic and pyocyanic infections did not respond satisfactorily. The ointment may be applied three times daily. The authors do not claim a cure-all. One of their summaries is that "neomycin is a valuable antibiotic for topical therapy."

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

The Value of Meat Inspection Service

The following is an excerpt from the Cortland County Health Department, New York, which publicizes the importance of a good meat inspection program. There is no doubt that the people of Cortland appreciate the service of Dr. A. K. Tice after they read his report published in December 1951.

"Condemned, unfit for safe, human consumption, 68 carcasses of beef, 34 carcasses of veal, 720 edible organs. That many diseased carcasses and edible parts were found in Cortland County slaughterhouses in 1951 by the Cortland County Health Department veterinarian, Dr. A. K. Tice. That much diseased meat was turned away from the meat markets you deal with. That many diseased steaks, chops, roasts, hamburgers didn't reach your table. Just what does that mean to you? It means safer meat was made available to Cortland County people. It means the meat inspection program of the Health Department has proved itself as worthwhile. It means that possible illness of you, your family, or friends was prevented. This rigid inspection drives the dealer with the sick cow away from our meat houses. Greater care is used in buying cows to be slaughtered. This is definitely a worth while project!

"The Health Department veterinarian inspected 4,560 carcasses in 1951. The search for diseased carcasses is only one part of his duties. More important is his inspection and control of the approved meat that does reach your table—the meat you do eat. The equipment of the slaughterhouses must be supervised constantly. The technics and procedures used in the handling of so much freshly killed meat must be above reproach. Recommendations for improvements in technics are constantly being made. Dangerous or questionable procedures are eliminated. These steps keep the approved meat clean and good up to the time it reaches your market.

"Now just think a moment. Suppose there were no meat inspection or plant supervision. Some counties don't have it. You would have eaten that meat from the 68 diseased cows. Good, healthy beef may have been contaminated by bad handling, processing and storage in unclean establishments. That might have happened—but didn't. The slaughterhouses were inspected. The 102 carcasses were condemned."

In the United States, two-thirds of the meat comes under federal inspection. The remaining one-third is either under local inspection or receives no inspection. In the communities where no inspection service is rendered, it has been observed that the poorest types of animals, which would be rejected by plants which are under inspection, are slaughtered. Many of these animals are ill at the time of slaughter and their products jeopardize the health of people who eat them. Good meat inspection is one of the most valuable public health services that veterinarians can render.

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Equine Encephalitis in Pheasants

Dr. J. C. Hart, Connecticut Department of Health, has reported that on October 19, 1951, word was received from the Department of Animal Diseases, College of Agriculture, University of Connecticut, that encephalitis was present in pheasants on two widely separated pheasant farms. On one farm, about 65 out of 200 birds had died from the disease and on the other, about 15 were ill out of a total of 2,500. Virus neutralization tests on strains isolated from one farm indicated that the etiological agent was eastern equine encephalomyelitis virus.

The identification of eastern equine encephalomyelitis is the first that has been reported in the northeastern United States since 1938 when a serious epidemic occurred in man and horses in Massachusetts. No human cases have been reported in Connecticut.

In a later report, Doctor Hart pointed out that the first outbreak occurred August 24 in a flock in which 200 of 800 birds died. The second epizootic began on September 21 on another farm on which 27 of 200 pheasants died. On the third farm where the disease appeared about October 1, 100 of 1,800 birds died. Investigators report that similar epizootics have occurred among pheasants in Connecticut since 1938, but the virus was only isolated in 1938 and 1951.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

How Diseases Become Established in Poultry Flocks

International travel and the speed with which deliveries can be made to all parts of the world via air express increase the chances for exotic diseases to be introduced into the United States. It, therefore, becomes essential for veterinarians and students of veterinary medicine to learn how to recognize diseases of foreign lands that might at any time appear in a flock or herd.

There are many examples of poultry ailments that have been introduced into this country from foreign sources. In 1924 and 1925, two diseases appeared simultaneously in eastern and midwestern United States. One of these, fowl plague, was recognized early and by adoption of a rigid slaughter and quarantine program, it was eliminated. Fowl plague was introduced again in 1929, and was eradicated once more quickly. Infectious laryngotracheitis, as the other disease is now known, appeared first in poultry feeding and killing establishments in the Midwest and later spread throughout the United States.

The fact that the two diseases appeared almost simultaneously is probably responsible for the failure to eradicate infectious laryngotracheitis before it became widespread and firmly established. It was a new malady not previously described any place in the world, while fowl plague was well known in Europe. This latter fact aided in the early diagnosis of fowl plague and helped to divert attention from the existence of another entity. By the time it was realized that a second disease was also present, eradication was impossible. It was not until 1930 that the virus which causes infectious laryngotracheitis was finally identified. It is the fault of no one that we must now live with infectious laryngotracheitis with little hope of its being eradicated. Experience gained in the early days of research on the disease did, however, make the veterinary profession realize the need for more and better research on all poultry diseases in order to be prepared for similar emergencies.

Newcastle disease is another example of an introduced affection which probably went undiagnosed for eight or ten years. Finally, it became a serious cause of mortality in California in the early 1940's and was recognized as one which had not previously been found in America. Even then, because it was not generally as acute nor as great a killer as the well described Newcastle disease of other parts of the world, it was not immediately recognized as the same one. An especially acute form was introduced into one state during the past two years by game birds which were brought to the United States by air express. They were apparently in the carrier stage at the time of shipment and transmitted the disease to other birds soon after arrival. Prompt recognition of the ailment, followed by destruction of the flock and a rigid quarantine and disinfection program, prevented further spread.

The birds in this shipment arrived at destination within three days after shipment, emphasizing the likelihood of introduction of exotic diseases by modern, rapid transportation facilities. Every veterinarian should be on the alert for the appearance of new diseases in his area. Prompt diagnosis is essential and utilization of available diagnostic laboratories is urged. Not only exotic diseases from foreign lands should be considered, but also those which may occur in isolated parts of America but not in your particular region should be constantly considered as possible causes of unusual losses.

Newcastle disease, and laryngotracheitis are now under control because research has found a preventive vaccine, but fowl plague, spirochetosis, *Aegyptianella pullorum* infection and Plasmodium infections, as examples, might not be so readily prevented if they once become established. Furthermore, no one will disagree that it would have been far more economical to have eradicated Newcastle disease and infectious laryngotracheitis before they became so widespread.

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G. T. Klein, extension poultryman, University of Massachusetts, says that one of the problems of using the built-up litter system according to the Ohio system for laying houses has been flea infestation of the litter. Rats, cats and dogs are common sources of the fleas in the poultry houses. Prevention consists in keeping these animals out of the houses, and in the use of lindane and DDT for control.

ABSTRACTS OF LITERATURE

Sodium Propionate in Veterinary Therapeutics

Results achieved with sodium propionate in the treatment of local bacterial and mycotic infections are noteworthy, according to report of its use on 188 cases[18].

Sodium propionate is capable of inhibiting the growth of a wide variety of pathogenic bacteria and fungi. Its toxicity is extremely low. It may be regarded as a physiological antibiotic of man since it is a normal constituent of human sweat and other body fluids.

Trials in the use of this agent cover an extended period. Three preparations were employed; a 10% aqueous solution, 5 and 15% ointments, and 5% vaginal cream. Similar preparations containing this salt of propionic acid, as well as calcium and zinc salt, are available in the United States.

Its use in ocular, aural, and genital diseases and dermatoses are reported by the author. Of the total number of patients treated, 50 had earlier resisted other forms of therapy and had reached a chronic stage. Its use has revealed highly advantageous characteristics as an innocuous antiseptic for routine, initial therapy. Its use allows more toxic agents to be reserved for special purposes, so minimizing development of side-effects and resistance.

For treatment of purulent conjunctivitis, 5% solution of sodium propionate instilled into the eye proved superior to sulfonamides, oxyquinoline, silver nitrate, yellow mercuric oxide, zinc sulfate, and penicillin ophthalmic ointments. Ointment containing 5% of the drug is routinely dispensed to supplement the solution.

Vaginal and preputial discharges have been satisfactorily controlled by application of vaginal cream containing 5% of the sodium salt of propionic acid.

Results achieved in the treatment of aural diseases compare favorably with other useful agents and resolution has been effected in those cases where other therapeutic agents have failed. Inflammatory processes involving the ear canal that are characterized by severe pain and exudation are successfully treated with both the 5% aqueous solution and ointments as indicated.

Ointments containing 15% of sodium propionate have been useful in a wide variety of eczematous lesions. Its use in these cases may be due to antihistaminic activity exhibited by the drug.

Clinical results reported have, in the author's experience, proved better than those achieved with many modern therapeutic agents.

[18]Tucker, S. J., Sodium Propionate in Veterinary Therapeutics. *Vet. Rec.*, 64:95 (Feb. 16), 1952.

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Johne's Disease in Sheep

Johne's disease, or paratuberculosis, in sheep was not reported in the United States until 1932. Since then, a number of discussions have appeared in American veterinary literature.

An outbreak of Johne's disease occurred in the flock of sheep maintained at the Montana Veterinary Research Laboratory, Bozeman[19]. One animal died and four were sacrificed from 1942 to 1945. In all, acid-fast organisms were demonstrated in smears from the mucosa of the ileum or colon.

In March 1945, all of the 130 sheep in the flock were tested with intradermic johnin. The diagnostic agent was injected in the caudal fold or in the area lateral to the rectum. Readings were made in 72 hours. On first test, 24 reactors were identified as positive and six as suspicious. On June 12, the same year, the intradermal test was repeated. Of 22 remaining reactors of the original 24, only ten were positive. Those classified as suspicious on the first test proved negative on the second. On third test of the entire group, 15 positive were revealed, of which 12 had been reactors on either one or both of the previous tests. It must be noted that a total of 18 sheep which had reacted to intradermic johnin came to autopsy. None of these which reacted to only one test exhibited evidence of infection, and of ten which had reacted on at least two tests, only in seven was some degree of thickening of the intestinal mucosa demonstrable, and smears were positive in only three of these.

The slow and insidious nature of the infection in the flock could not be allowed to continue because of the various experimental projects planned. The entire flock was disposed of, premises cleaned and left vacant for approximately one year. Subsequent restocking has been possible and the premises are now considered to be free of the infection.

[19]Marsh, Hadleigh, Johne's Disease in an Experimental Flock of Sheep and its Elimination. *Jour. Am. Vet. Med. Assn.*, 120:20 (Jan.), 1952.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

THE ZOOLOGY OF TAPEWORMS, by *Robert A. Wordle* and *James Archie McLeod.* University of Minnesota Press, Minneapolis, publishers, 1952. — Price $12.50.

This book, as stated by the authors in the preface, describes the tapeworms of the world and the present day knowledge of them. The book is composed of two parts; the first consisting of features, life cycle, biology, origin and classification, the second part is detailed systematic description and keys for all known genera of the world and species of North America.

An attempt is made to consolidate all literature on the subject of tapeworms in a single volume. The listing of references alone occupies 204 pages. This book should serve as a valuable reference work for parasitologists, zoologists and other specialists in taxonomy, but it is extremely doubtful if the publication is of value to other than specialists in helminthology. It would have been much strengthened as a reference book for students not too familiar with the field if the index for part II had been expanded sufficiently to include genera, particularly since many changes in existing classifications have been made. Five new orders and six new families are established in the class Cestoda alone, with many generic changes. For example, the genus Diphyllobothrium is, according to the authors, reserved for the dibothriocephalid tapeworms of toothed whales, distributing the other species formerly among this genera to Diplogonoporus, Cordicephalus, Spirometra, and Dibothriocephalus; fish tapeworm commonly referred to as *Diphyllobothrium latum* is now classified as *Dibothriocephus latus.* Taeniarhyncus (Weinland 1858), is the generic name given to the beef tapeworm although all medical and veterinary texts list it as *Taenia saginata; Hydatigera* (Rudolphi 1808), is applied to the tapeworms of cats described in most texts under the name *Taenia taeniaeformis.* The book represents a tremendous amount of work and thought but is primarily of value to persons who are specialists in the field of helminthology and interested in taxonomy.—*R. D. Turk, D.V.M.*

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A.V.M.A — Atlantic City, June 23-26, 1952

THE STRUCTURE OF THE FOWL, by *O. Charnock Bradley,* M.D., D. Sc., F.R.C.V.S., revised by *Tom Grahame,* T.D., F.R.C.V.S., F.R.S.E., Professor of Anatomy, Royal (Dick) Veterinary College, Edinburgh, Scotland. 128 pages, 102 illustrations, including 23 plates. J. B. Lippincott Company, East Washington Square, Philadelphia, Pa., American publishers, 3rd ed., 1950.—Price $4.00.

First published in 1915, revised in 1937 and brought up to date in 1950, this book deals with anatomy and embryology of the fowl. Material is presented concisely by one of the recognized experts among English speaking authors.

Illustrations are drawn in detail and are well keyed. Plates printed on fine, glossy paper stock are largely reproductions of photomicrographs which detail features of histological anatomy. Some of the larger drawings are reproduced in color to show the course of veins (blue) and arteries (red).

This text should be available to all those interested in poultry practice, to serve as a basic reference to anatomical considerations, including the digestive apparatus, of domestic birds.

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PIPE DREAMS ABOUT LEATHER AND SADDLES, by *Leonard K. Mason.* 84 pages with a group of illustrations appended. Walsall Lithographic Co., Ltd., London, England, publisher, 1952.—Price 8 s. 6 d.—about $1.25.

"There is," states the author, "nothing . . . like leather."

This little book is pleasant reading about leather and saddles. Brief, but comprehensive, it explains facts, including the definition of terms used by specialists of the crafts. The reader is frequently reminded of the ancient traditions, methods, and uses of hides and leather and the advantages it possesses over other materials for modern day use.

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The U. S. Public Health Service reports of food poisoning epidemics in 1949 indicated that poultry meat was associated with 32.5% or 2,679 of the 8,235 outbreaks.—*James H. Steele, D.V.M.*

A MESSAGE OF IMPORTANCE

To Veterinarians . . . From a Veterinarian

Mastitis is a herd problem best handled by close co-operation between the herd owner and his veterinarian, yet more than 60 per cent of herd owners now by-pass the veterinarian.

While a veterinarian may not be available to all farmers, most home treatment is caused by the owner's desire to save expense and his preference of other sources of supply.

If this trend toward home treatment continues, it can be a serious threat to the practice of veterinary medicine.

As originators of the penicillin bougie and manufacturers of Mastics for the treatment of mastitis, we have a large stake in veterinary medicine.

Our fixed policy has always been "sold through the veterinarian only," and we hope to be able to continue with this policy. However, we must accept human nature as it is and co-operate to the best of our ability

Since delay in treating mastitis may cause irreparable loss, most herd owners want effective treatment they can use themselves at once. But the veterinarian is best qualified to instruct herd owners how and when to use medication, also, under what circumstances a veterinarian should be called.

We think the veterinarian has an opportunity to be of service to the large group of herd owners who now by-pass him. We are trying to find ways to co-operate with this group and show them that we as veterinarians have something they need. Our present advertising in farm papers, as shown at the right, is directed along this line.

F. E. MARTIN, V. M. D.
The Martin Laboratories
West Chester, Pennsylvania

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Lindane (0.5%) as a spray or dip will give satisfactory control of mange and lice in hogs.

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Occupational diseases in poultry processing plants, including respiratory, ocular, and skin diseases, are serious public health problems.

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Twenty-five percent of the total number of shipping fever outbreaks in the Colorado studies occurred in herds on farms and ranches where shipment was not a factor.

▼

Sulfur in the diet is the key to fast healing of wounds on the battlefield, in accidents, or in the operating room, according to experiments with rats conducted at the Loyola Medical School.

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Report of a survey to determine the incidence of trichinae in swine indicated that only a small fraction of 1% of farm raised hogs are affected; whereas, approximately 9% of hogs known to be garbage fed harbor these parasites. —*Annual Rept., Chief, BAI, 1951.*

Meat trays, the small wooden containers used in butcher shops, make excellent feeding dishes for small animals.

▼

Americans donated 1,225,000 pints of blood through the Red Cross to the military forces in the first 18 months following the start of the war in Korea.—*S.N.L.*

▼

Beef production is a record of remarkable accomplishment. In the face of great increases in population, production has maintained the average per capita consumption.

▼

An Improved Stethoscope

A stethoscope designed for the hard-of-hearing physician has been recommended for use by veterinarians. This instrument is the Fleming microphonic stethoscope. It is claimed to clarify and amplify heart sounds without impairment of pitch. It is available from A. S. Aloe Company, St. Louis, Mo., or branch offices of that company.

Artificial Eye for a Bull

The artificial eye, believed to be the largest ever made, was molded from plastic material by the American Optical Company, Southridge, Mass., for the prize Hereford bull owned by the firm of F. F. McIntosh & Son.

The animal's eye was injured in a fight; the eyeball punctured by the horn of his antagonist with loss of a portion of the vitreous humor, resulting in shrinking of the organ. The plastic eye was prescribed for cosmetic effect on the bull's appearance during the coming show season. It fits over the shrunken eye and moves in coordination with the normal eye. Pupil is said to be ten times that of conventional eyes manufactured (see insert in illustration); overall size is three times greater. Identical technic developed by the American Optical Company for the production of human eyes was employed in the production of this prosthesis.